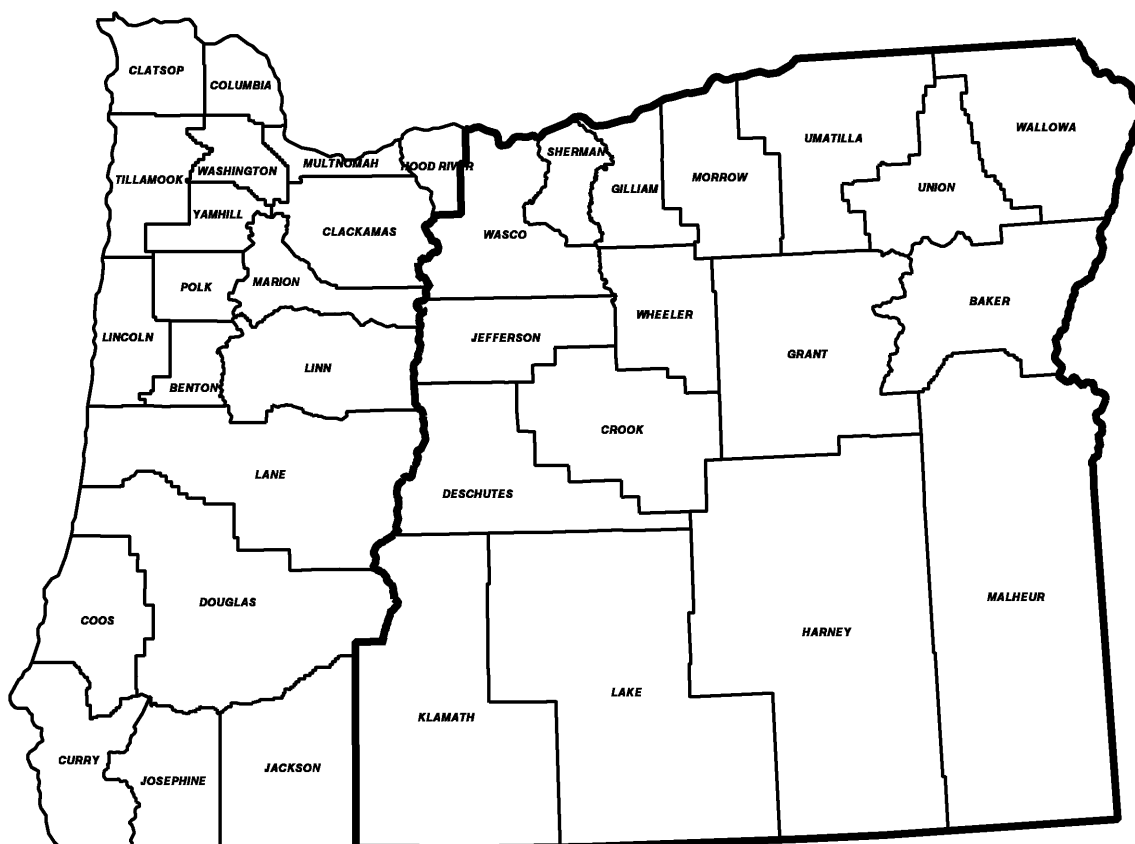


FIELD INSTRUCTIONS
FOR THE
TIMBERLAND INVENTORY OF
EASTERN OREGON
1998



Pacific Resources Inventory, Monitoring, and Evaluation Program
Pacific Northwest Research Station
USDA Forest Service

FIELD INSTRUCTIONS
FOR THE
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EASTERN OREGON
1998

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TABLE OF CONTENTS

I. INTRODUCTION.....	1
A. Purposes of this manual.....	3
B. Organization of this manual	3
C. The inventory of eastern Oregon	3
Background	3
Inventory design	4
Products	4
D. Additional sources of documentation	4
II. TRAVEL PLANNING AND LOCATING THE PLOT	5
A. Landowner contact.....	7
Permission.....	7
Recording conversations with landowners.....	7
B. Before leaving base camp	7
C. Checklist of items needed on plot	7
Data recording items.....	7
Photo interpretation items.....	7
Plot measuring items	8
Plot referencing items.....	8
First aid items	8
Personal and safety gear	8
D. Safety.....	8
Safety in the woods	8
Safety on the road	9
What to do if injured	11
E. Plot location aids	11
Revisited plots	11
Plots not previously visited	11
F. Locating the plot on the ground	11
Locating previously measured plots	11
Locating new plots	12
G. Plots with active logging	13
H. Access-denied plots.....	13
III. PLOT LAYOUT AND REFERENCING	15
A. Background: plot layout at previous inventories	17
Occasion 1	17
Occasion 2	17
Occasion 3	17
Occasion 3.5	17
Oregon Demonstration Project.....	17
Forest Health Monitoring Program	17
Occasion 2 and 3 subplot location	18
B. Determining if a plot and its subplots are in inventoried area at Oc4	18
C. Background: plot layout at the current inventory (Oc4).....	18
What type of plot to install at Oc4	19
Timberland zone.....	19
1998 Plots.....	19
1999 Plots.....	19
High-desert zone	19
5-point plot layout diagram	19

III. PLOT LAYOUT AND REFERENCING Cont'd.

D. Plot layout and subplot numbering at Oc4 on plots visited at Oc3	20
1. Revisit ## subplots:.....	20
2. Revisit R# subplots:	20
3. Establish an N# subplot:	20
A special case:.....	20
4. Revisit X# subplots:	21
5. Replace each substituted (or "substituted and moved") subplot with a N# or C# subplot:	21
The new subplot is a <u>N# subplot</u> if ANY of the following are true:	21
The new subplot is a <u>C# subplot</u> if ALL of the following are true:	21
E. Plot layout and subplot numbering at Oc4 on NEW plots:	24
1. A subplot is a <u>C# subplot</u> if BOTH of the following are true:	24
2. A subplot is a <u>N# subplot</u> if ANY of the following is true:	24
3. If the new <u>plot</u> replaces a 16.95-meter vegetation profile plot:.....	24
F. Nonforest condition classes present on subplots	26
G. Hazardous plots.....	26
1. If all subplots on the standard layout are too hazardous	26
2. If one or more, but not all subplots on the standard layout are too hazardous.....	26
3. If part, but not all of a subplot on the standard layout is too hazardous.....	26
H. Recognizing and mapping condition classes	26
1. Recognize and map condition classes that differ by land class within inventoried area	26
2. Recognize and map condition classes within forest land that differ by broad stand condition	27
The two-class rule	27
Exceptions to the two-class rule	27
3. Recognize and map condition classes within forest land that differ by owner class condition	28
I. Two conditions or one?	29
J. Conditions that can not stand alone	29
K. Identifying boundaries between condition classes	31
1. Distinct boundaries	31
2. Indistinct land class boundaries.....	32
L. Rules for determining condition classes that differ by land class:.....	32
1. Cultural nonforest stringers	32
2. Streams	32
3. Maintained structures.....	32
4. Stringers and Necks.....	32
5. Intermingled forest and other natural vegetation	33
6. Forest land amputated by a cultural nonforest stringer	33
M. Rules for determining forest condition classes that differ by stand condition	34
1. Stringers and Necks.....	34
2. Intermingled stand conditions	35
3. Forest land amputated by a cultural nonforest stringer	36
N. Rules for determining forest condition classes that differ by owner class condition.....	37
1. Subdivide only condition classes previously defined by GLC and stand condition classes...	37
2. Subdivide conditions when a property boundary between two different owner class categories is present.....	38
3. Subdivide only forested conditions.....	38
4. Subdivide ownership class conditions only when a distinct boundary is visible on the ground	39
O. Referencing the plot	39
1. Referencing a plot visited previously.....	39
Referencing a lost plot	39
2. Referencing plots not visited previously	40
3. An exception.....	40
4. The reference point (RP)	40
5. Referencing the cedar stake	41

III. PLOT LAYOUT AND REFERENCING Cont'd.

P. Referencing the other subplots on the standard layout	41
1. Mark subplot center.	41
2. Select reference trees.....	41
3. Tag the reference trees.....	42
4. Record data about the reference trees	42
Q. Recording reference tree data (all subplots on the standard layout)	42
1. If a tally tree.....	42
2. If not a tally tree.....	42

IV. SUBPLOT ATTRIBUTES

Required tally for the subplot attribute record	45
A. Subplot Identification	45
B. Physioclass Information	45
Aspect	45
Slope.....	46
Topographic position	46
C. Stream Information.....	47
Stream class.....	47
Stream proximity	47
D. Nonforest Inclusions (16.95-meter fixed-radius plots).....	47
1. General instructions	47
2. Downloaded estimates of nonforest inclusion.....	48
E. Condition Class (16.95-meter fixed-radius subplots)	49
1. General instructions	49
2. Mapping condition classes on the subplot diagrams	49
3. Estimating and recording area percentages by condition class.....	50

V. CONDITION CLASS ATTRIBUTES.....

Required tally for the plot attribute record.....	55
Field Data Recorder Entries by Item Number	55
Item 1--County.....	55
Item 2--Plot number.....	55
Item 3--Zone.....	56
Item 4--Sample kind	56
Item 5--Oc4 owner class	57
Ownership class definitions	58
Item 6--Date of Oc4 inventory.....	59
Item 7--Date of Oc3 inventory.....	59
Land Class Definitions	59
Item 8--Oc4 ground land class.....	59
Forest land (codes 20-50)	59
Other Forest Land (codes 41-50)	59
Nonforest land (codes 63-92).....	61
Item 9--Oc3 ground land class.....	61
Item 10--Basal Area Factor.....	62
Item 11--Precipitation	62
Item 12--Elevation	62
Item 13--Hydrologic unit code	62
Item 14--Condition class aspect.....	62
Item 15--Condition class slope	62
Item 16--Topographic Position	62
Item 17--Soil depth	62
Item 18--Harvest before Oc3	63
Item 19--Year of harvest before Oc3.....	63
Item 20--Disturbance before Oc3.....	63
Item 21--Harvest since Oc3	64
Item 22--Year of harvest since Oc3	65

V. CONDITION CLASS ATTRIBUTES Cont'd.

Item 23--Year of harvest since Oc3 confirmed?	65
Item 24--Disturbance since Oc3.....	65
Item 25--Silvicultural treatment since Oc3	66
Item 26--Type of Logging.....	66
Item 27--Forest Type	67
Item 28--Stand Size.....	67
Item 29--Stand Age	67
Item 30--Plant Association	68
Item 31--Stand Condition	70
Item 32--Crown Closure at Oc3.....	70
Item 33--Crown Closure at Oc4.....	70
Item 34--Oc3 remeasurement period	71
Item 35--Oc3.5 remeasurement period	71
Additional instructions for Items 18 through 31	71

VI. SITE INDEX.....73

A. Introduction.....	75
B. Site trees: general instructions	75
Previously visited plots	75
New plots.....	75
C. Selecting site trees: general instructions	76
D. Selecting site trees: tree criteria.....	76
E. Site tree data	77
Item 1--Site Tree number (#)	77
Item 2--Subplot number (SUB PL)	77
Item 3--Condition class (CC).....	77
Item 4--Tree number (TRN)	77
Item 5--Azimuth (AZ)	77
Item 6--Species (SPC).....	77
Item 7--D.b.h. (DBH).....	77
Item 8--Height (HT).....	77
Item 9--Breast-height age (BH AGE).....	77
Item 10--Site Index (SI)	78
Item 11--Site index equation number (EQ).....	78
F. Site trees: post-field review	78

VII. VEGETATION PROFILE.....79

A. General design instructions for vegetation profile plots	81
B. Species records	82
General procedures	82
Tree seedlings and shrubs.....	82
Forbs	83
Grasses and "grass-like" plants	83
Perennial grasses	83
Annual grasses	83
1. Species.....	83
Is it a tree or is it a shrub?	84
2. Canopy layer	85
3. Vegetation plot percent cover	85
4. Stage of development for shrubs	86
C. Vegetation profile plot - total cover and layers	86
1. Percent cover of "all shrubs", "all forbs" and "all grass"	86
2. Summary of canopy layer heights.....	86
3. Percent Bare Soil.....	87
4. Percent Total Vegetation Cover	87

VII. VEGETATION PROFILE Cont'd.	
D. Seedling Count.....	87
1. Pacific Yew seedling count	88
2. Seedling count - species other than Pacific Yew	88
E. Collection and identification of unknown plants	88
VIII. TRACKABLE TREE AND SNAG SELECTION	89
A. Introduction.....	91
B. Determining if a tree <12.5 cm. d.b.h. is selected on the 2.41/2.96 meter fixed-radius plot	91
C. Determining if a tree or snag ≥12.5 cm. d.b.h. is sampled using variable-radius sampling	91
D. Trackable tree and snag selection.....	93
E. Seedling requirements	96
IX. TRACKABLE TREE AND SNAG DATA	97
Data recording	99
Item 1--Line number (LINE #):	99
Item 2--Subplot number (Sub Pl):	99
Items 3 and 4--Condition class (Cc) and Tree history (TH)	99
Item 5--Species (SPC).....	101
Item 6--Azimuth (AZM)	102
Item 7--Distance (DIST).....	102
Item 8--Tree number (TRN)	102
Item 9--Oc3 to 4 Increment (INC)	102
Item 10--Oc3 d.b.h. (Oc3 DBH)	104
Item 9B--Oc3.5 to 4 Increment.....	104
Item 11--Oc4 d.b.h. (OC4 DBH).....	105
Item 12--Oc3 height (Oc3 HT)	109
Item 13--Oc4 height (OC4 HT).....	109
Item 14--Breast-height age (BH AGE).....	111
Item 15--Oc3 crown ratio (C)	112
Item 16--Oc4 crown ratio (R)	112
Item 17--Oc3 crown class (C)	113
Item 18--Oc4 crown class (C)	113
Item 19--Mistletoe (M)	114
Item 20--Hardwood clump (CL).....	115
Item 21--Cull other/hardwood form class (CO)	116
Item 22--Cull rot (CR)	118
Items 23 through 28--Damaging agent/severity (Agt, S).....	119
Item 25--(Agent 2) Cause of death/Wildlife use or Reason for disappearance/Harvest use ...	124
Item 24--Oc3 snag decay class.....	125
Item 26--Oc4 snag decay class.....	125
Tree record comments.....	126
X. COARSE WOODY DEBRIS	127
A. Introduction.....	129
B. Definition of coarse woody debris.....	129
C. Sampling methods.....	129
D. Locating and establishing line transects	130
E. Tally rules for coarse woody debris	130
F. Tally rules for CWD when the piece lays across two or more condition classes:	133
G. Marking CWD.....	135
H. Recording procedures.....	135
I. Individual data items	136
Item 1--Subplot number (PT)	136
Item 2--Transect (T).....	136
Item 3--Condition Class (C)	136
Item 4--CWD slope distance (CWD DIST)	136

X. COARSE WOODY DEBRIS Cont'd.

Item 5--Species (SPC).....	136
Item 6--Diameter at point of intersection (TRAN DIAM)	136
Item 7--Diameter at the small end (SML DIAM)	137
Item 8--Diameter at the large end (LRG DIAM)	137
Item 9--Total length (TOTAL LENGTH)	137
Item 10--Condition class length (COND LENGTH)	137
Item 11--Decay class (DECAY CLASS)	138
Item 12--Number of other pieces contacted (# CONT)	138
Item 13--Orientation on slope (ORNT)	139
Item 14--Is the piece hollow? (HOL?).....	139
Item 15--Transect condition class distance (TC DIST)	140
Item 16--Slope percent (SLP PCT)	140
J. Sampling Residue Piles.....	140
Selection instructions.....	140
Individual data items:.....	141
Item 1--Subplot number (SUB PL)	141
Item 2--Condition class (CC).....	141
Item 3--Pile azimuth (PILE AZM)	141
Item 4--Shape (SHP)	142
Item 5 and 6--Length 1 and Length 2 (LNG1, LNG2).....	142
Item 7 and 8--Width 1 and Width 2 (WID1, WID2).....	142
Item 9 and 10--Height 1 and Height 2 (HT1, HT2).....	142

XI. TREE COVER..... 143

A. Introduction.....	145
B. General instructions.....	145
C. Tally rules.....	146
D. Tree cover data	149
Item 1--Subplot number (SUB PLT)	149
Item 2--Transect line (T)	149
Item 3--Start of line (S)	149
Item 4--Condition class (C)	149
Item 5--Species (SPC).....	149
Item 6--Canopy Layer (LAYER)	149
Item 7--Beginning distance (DIST1).....	149
Item 8--Ending distance (DIST2).....	150
E. Summary for canopy layers	150

XII. STOCKING SUBPLOTS..... 153

A. General instructions.....	155
B. Locating and numbering stocking subplots	155
C. Tree selection.....	158
D. Tree data.....	160
Item 1--Stocking subplot number (Sub pl)	160
Item 2--Condition class (Cc)	160
Item 3--Species (SPC).....	160
Item 4--Diameter (DBH).....	160
Item 5--Height (HT).....	160
Item 6--Breast-high age (BH AGE).....	160
Item 7--Crown ratio (CR).....	160
Item 8--Damaging agent and severity (Agt, S)	160
Item 9--Mistletoe Rating (M)	160
Item 10--Crop tree (CT)	160
E. Inhibiting vegetation.....	161
F. Precommercial thinning on stocking subplots	162
G. An exceptional case	162

XIIIa. COORDINATES (GPS)	163
A. Overview	165
B. When and where to collect readings	165
C. Recording GPS information	165
GeoExplorer	165
PLGR	165
D. Instructions for the GeoExplorer	166
Collecting coordinates	166
Managing and deleting files	167
E. Instructions for the PLGR.....	167
Manipulating the PLGR:.....	167
PLGR Setup Options	168
Operating the PLGR	169
Navigating by using the PLGR	169
F. Batteries	169
GeoExplorer	169
PLGR	170
Primary batteries.....	170
Memory battery	170
G. Turning a machine off:	170
GeoExplorer	170
PLGR	170
XIIIb. LASER 200 INSTRUCTIONS	171
A. Overview:	171
B. Basic operation:	171
C. Settings:	171
D. Filter and Reflectors:	172
E. Distances and % slope:.....	172
F. Tree heights:.....	172
G. Gates:	172
H. Cumulative distances:	173
XIV. APPENDICES.....	175
APPENDIX 1 -- SLOPE CORRECTION TABLE	177
APPENDIX 2 -- HORIZONTAL LIMITING DISTANCE TABLE	178
APPENDIX 3A -- STOCKING CALCULATION TABLE, 20 BAF.....	179
APPENDIX 3B -- STOCKING CALCULATION TABLE, 30 BAF.....	180
APPENDIX 3C -- LOW SITE (GLC 49) PLANT ASSOCIATIONS	181
APPENDIX 4 -- LIST OF THE OC3 20 BAF PLOTS.....	183
APPENDIX 5 -- METRIC EQUIVALENTS AND AIDS	184
APPENDIX 6 -- ACCESS-DENIED PLOTS	186
APPENDIX 7 -- OC1, OC2, AND OC3 10-POINT PLOT LAYOUT	188
APPENDIX 8A -- HELLO LETTER	189
APPENDIX 8B -- LANDOWNER CONTACT LETTER	190
APPENDIX 9 -- GLOSSARY	192
APPENDIX 10A -- CHECK PLOTS.....	199
APPENDIX 10B -- CHECK PLOT FORMS	200
APPENDIX 11 -- INSECT AND DISEASE KEYS.....	205
APPENDIX 12 -- TREE VOLUME TABLES.....	209
APPENDIX 13 -- SAMPLE PLOT FORMS.....	211
APPENDIX 14 -- INDEX.....	227
APPENDIX 15A -- IMPORTANT PHONE NUMBERS.....	231
APPENDIX 15B -- VEHICLE & PHONE NUMBERS	232
APPENDIX 16 -- BLANK PAGES FOR NOTES.....	233

I. INTRODUCTION

TABLE OF CONTENTS

I. INTRODUCTION	3
A. Purposes of this manual.....	3
B. Organization of this manual	3
C. The inventory of eastern Oregon	3
Background	3
Inventory design	4
Products	4
D. Additional sources of documentation	4

I. INTRODUCTION

This manual documents the field procedures by the Pacific Resources Inventory, Monitoring, and Evaluation Program (PRIME) in the 1998-1999 inventory of eastern Oregon.

PRIME, a program within the Pacific Northwest Research Station (PNW), USDA Forest Service, is one of five Forest Inventory and Analysis work units across the United States. PRIME is responsible for inventorying the forest resources of Alaska, California, Hawaii, Oregon, and Washington.

A. Purposes of this manual

This manual serves two purposes, to:

- instruct field personnel in how to locate and measure field plots in the 1998-1999 inventory of eastern Oregon.
- document the field procedures, methods, and codes used in the inventory.

B. Organization of this manual

This manual is structured primarily for use by field personnel. Each chapter corresponds either to a separate function that must be performed in locating and measuring a field plot, or to a particular aspect of data recording that must be completed. Information that is infrequently used or that is included only for documentation is in the appendices at the end of this manual. A glossary and an index are provided for quick reference.

C. The inventory of eastern Oregon

Background

PRIME inventories all of eastern Oregon except for large bodies of water (Census water) and land administered by National Forests. Inventories conducted by the National Forest System are combined with the PRIME inventory to provide information across all ownerships.

The 1998-1999 inventory of eastern Oregon represents the fourth visit to a permanent grid of field plots established and periodically reinventoried by PRIME. These plots were previously visited in 1964 (central unit) and 1969 (Blue Mountain unit), 1977 and 1986-1987. A portion of plots was visited in 1992 as part of a mid-cycle update. Note: Throughout this manual the abbreviations "Oc1", "Oc2", "Oc3" and "Oc3.5" refer to these previous eastern Oregon inventories: occasions 1, 2, 3, and 3.5 respectively. The current 1998-1999 inventory is labeled "Oc4" (occasion 4) in this manual.

Previous inventories were conducted in the 1930's and in the 1950's. In the 1930 inventory, existing information on forest types, timber cruises, logging records and other data was collected from private individuals and public agencies. These data were field checked and adjusted to the then existing inventory specifications. All lands were classified as forest or nonforest. Forest land was classified as either commercial or noncommercial. Commercial forest land was further classified by type, size and stocking class and was mapped on base maps of each forested township. A superimposed ownership map was dot counted to obtain area statistics by forest type and owner class for each county.

In the 1950's inventory, aerial photos were used to create forest type maps for each county. Forest type, size, and stocking classes were similar to the ones used in the previous inventories, but the use of photographs allowed a much higher degree of detail and accuracy. In addition, net sawtimber, growing stock, cull, and salvable dead volumes were calculated by applying per-acre volumes to the acreage of each forest type class. Per acre estimates were obtained through a system of sampling stands in each different classification. Field samples were measured using a series of three one-fifth-acre circular plots spaced at six-chain intervals. This design was subsequently changed to the sampling scheme currently in use.

Inventory design

The eastern Oregon inventory design is based on a double sample for stratification as described by Cochran (1977, p. 327-335), but differing from Cochran's description in that both primary and second phases are permanent, systematic grids of photo and field plots and therefore, not strictly allocated proportionally by stratum. The primary plots are on a 1.37 kilometer (0.85 mile) grid that was established on base maps and transferred to aerial photos. The primary grid is subsampled by the secondary field grid. The field plot grid is laid out on 5.47 k (3.4 mile) intervals, providing an average of one secondary field grid location for every 16 primary photo plots. The primary phase--the photo grid--is used to stratify inventoried area by land class and degree of urbanization, and, where forest land, by forest condition. The stratification reduces overall variance, resulting in more precise estimates of forest area and volume statistics. Data collected on the field plots are used to adjust area estimates developed from classification of the primary grid and to obtain comprehensive information about forest conditions that is of known precision.

During the Oc4 inventory of eastern Oregon the absence of recent, acceptable scale aerial photographs will prohibit the remeasurement of the primary grid. Information on reserved, and other lands now in the inventory will be added to the primary grid data collected at Oc3, which will again be used for stratification. The lack of a primary phase will allow the intensification of the field grid sample. Plots will be installed at additional locations, including in poorly stocked other-forest lands not meeting the definition of forest land, and not previously field sampled.

Products

PRIME provides information needed by resource planners, policy analysts, and others involved in forest resource decision-making. Data collected in PRIME inventories is summarized, interpreted, analyzed, and published in statistical and analytical reports of national, state, and subregional scope. PRIME publishes information on area by forest land and owner classes and by degree of urbanization; timber volume, growth, mortality, and removals; potential forest productivity; opportunities for silvicultural treatment; and kind and area of wildlife habitats. PRIME also provides data to answer questions about forest resources.

D. Additional sources of documentation

More information about the 1998-1999 inventory design and procedures are available in the following documents which are on file at the office of the program in Portland, Oregon:

Forest Survey field instructions for eastern Oregon -- 1977.

Field instructions for the inventory of eastern Oregon -- 1986-1987.

Central Oregon Photointerpretation (PI) manual -- 1986-1987.

Field instructions for the inventory of eastern Oregon -- 1992. (mid-cycle update)

Complete documentation of the 1998-1999 inventory of eastern Oregon (when finished in 1999)

II. TRAVEL PLANNING AND LOCATING THE PLOT

II. TRAVEL PLANNING AND LOCATING THE PLOT	7
A. Landowner contact.....	7
Permission.....	7
Recording conversations with landowners.....	7
B. Before leaving base camp	7
C. Checklist of items needed on plot	7
Data recording items.....	7
Photo interpretation items.....	7
Plot measuring items.....	8
Plot referencing items.....	8
First aid items.....	8
Personal and safety gear	8
D. Safety.....	8
Safety in the woods	8
Safety on the road	9
What to do if injured	11
E. Plot location aids	11
Revisited plots	11
Plots not previously visited	11
F. Locating the plot on the ground	11
Locating previously measured plots	11
Locating new plots	12
G. Plots with active logging	13
H. Access-denied plots.....	13

II. TRAVEL PLANNING AND LOCATING THE PLOT

A. Landowner contact

Permission

Written or verbal landowner permission must be obtained before a plot is visited. This responsibility lies with the field coordinator who may delegate contacting the landowner to the field crew.

In preparing for the field season, PRIME sent each non-industrial private landowner with a plot on their land (owner class code 51) a letter that asked permission to visit and measure the plot. If the owner responded, a postcard with their response is in the plot jacket. Owners of large land areas--primarily private timber companies and public agencies--are contacted individually; access information for these plots will be provided by the crew coordinator or will be included in the plot jacket.

Recording conversations with landowners

Include a record of each conversation with a plot landowner on the Ownership Contact form. While not a part of the official plot record, this information will document that permission was obtained, assist in accessing the area for check-plots, and possibly aid the field crew during a future inventory. Ask landowners if they can confirm the dates of any disturbance (usually harvesting) on the plot since Oc3; record this date on the Plot Attribute Record. Record any special circumstances about plot accessibility--such as locked gates or washed-out roads on the Plot Record.

B. Before leaving base camp

1. Make sure the landowner has been contacted (see above).
2. Plan the route to the plot. Always bring two or more extra plots.
3. Leave word of plot locations and expected destinations with the crew coordinator.
4. Make sure your vehicle has all of the necessary field gear and a plot map.
5. Be in agreement with your crew partner(s) on a work procedure.
6. Inspect vehicle for fuel, oil, lights, safety features, and plot supplies (stakes, tags, pins, and nails) prior to departure.

C. Checklist of items needed on plot

Data recording items

Previous plot records and photos
Plot jacket (Oc2, Oc3, and Oc4 plot records with subplot diagrams, and field photos)
Hand-held data recorder downloaded with plot records; extra AA batteries
GPS unit with fully-charged batteries
Mechanical pencils, red photo pen, black pen, eraser
Note pad(s) made of "write-in-the-rain" paper
Blank forms for tree tally, CWD, veg profile, stocking tally, tree cover, and subplot diagram
Calculator(s)
Tatum and tatum aids
Field procedures manual
Residue pile tally sheets
Plant ID guide(s), plant association guides, plant disease guide

Photo interpretation items

Plot (road) map
Stereoscope(s) (2x and/or 4x) with case and sharp straight pins
Photo scale (Timber Survey Aid #16)
15 centimeter ruler calibrated in millimeters
Hand lens

Plot measuring items

Prism(s) 20 and/or 30 BAF
Compass(es)
Clinometer(s)
Diameter tape(s)-7.5 meter
Increment borer(s) with sheath
30-meter tape(s) with carabiner(s)
Hand axe(s) with sheath
Laser height/rangefinder
Plant press for plant specimens and paper bags for root disease samples

Plot referencing items

Cedar stakes
Steel plot pins
Nails
Tree number tags
Square tags
Round tags
Flagging tape

First aid items

First aid kits
Bee sting and/or snake bite kits

Personal and safety gear

Canteens with water
Lunches
Utility pouch
Vest and hardhat
Rain gear
Gloves
Extra clothing

D. Safety

Personnel working in the field are subject to many safety hazards. Each person must always be conscious of these hazards to avoid accidents:

1. **Don't take chances!**
2. **Eliminate horseplay and carelessness!**
3. **Think safety!**
4. **No task is more important than personal safety!**

Safety in the woods

Wear protective clothing: Long-sleeved shirts, long pants, and gloves may protect you from contact with brush and rocks, poison oak, and stinging insects. Trouser legs should be loose enough to avoid binding or cramping, and should not have cuffs. Wear a hardhat at all times in the woods. During hunting seasons, wear bright red or orange clothing.

Wear good quality boots that provide good support and traction. For example: 8-inch high leather work boots with lug-soles (Vibram-type soles).

Walk, don't run in the woods. Take your time and plan your route. Avoid plunging through the brush. The best route of travel may not be the shortest. Routes across brushy, irregular terrain with rocks and down logs can be hazardous.

Be watchful of twigs and branches which may cause eye injury. Be especially alert when stepping up to trees which retain their small dead twigs. Keep a sufficient distance behind the person ahead of you to avoid being slapped by branches.

Lift knees high to clear obstacles in heavy undergrowth or slash. Slow down and watch your step.

When contouring a steep slope, do not lean into the hill. This tends to loosen footing. Erect posture or slightly leaning out gives more secure footing.

Know how to fall to avoid hard impacts. Keep flexible with knees slightly bent. If you feel yourself slipping, pick a landing spot. Do not stick your arms out to break a fall. Roll with the fall. Try to take the impact on the side of your body rather than your back.

Don't take chances by walking across ravines on small logs.

Bee aware. Keep an eye out for yellow jacket and hornet activity. Yellow jackets nest in the ground, often in well-decayed logs or in thick moss on trees or in snag cavities. Yellow jackets are particularly active (nasty) during late summer and early fall when forest conditions are very dry. Hornets nest above ground in "paper" nests that are suspended from branches; woe befalls those who unwittingly bump their head against a nest, or shake the sapling from which a nest is suspended. If allergic to insect stings, carry medication to counteract the effects of stings.

Be alert to rattling or buzzing noises. Look before putting hands or feet on or under rocks and logs. Be alert when walking in snake-infested areas.

Avoid poison oak, if possible. Place oil on exposed skin before going to field. After contact with poison oak, remove clothes carefully, wash exposed areas with cool, soapy water, and wash clothes before wearing them again.

Keep someone posted as to where you plan to work each day, particularly on long hikes into the forest, so that if you do not return in a reasonable time, someone can find you.

Keep hatchets in their sheath except when actually using them, and snap the sheath shut.

First Aid. Keep your individual first-aid kit completely supplied, and know how to use it. Treat all wounds promptly. Each vehicle is supplied with a large first-aid kit – keep it stocked.

Carry matches and possibly a small flashlight. On very long hikes, take extra food, clothing, and matches in case you are caught out in the woods at night. Never build fires in forest duff or leave a campfire until it is dead out.

Check for ticks. The beasties bite and can carry Lyme disease.

Carry plenty of water. Don't expect your partner to carry water for you.

Beware of lightning. Watch for approaching storms. Avoid prominent high exposed ground and tall/lone trees. Abandon field gear, especially that made of metal. Seek shelter in the vehicle if possible, otherwise in thick timber, large caves or in valley bottoms. Crouch on the balls of your feet with your head covered. Separate 30 meters from other crew members.

Safety on the road

It all pays the same, so drive with care, with courtesy, regardless of others' actions, and with common sense. Follow these tips:

Seat belt use is required in all government-owned or leased vehicles and is required by law in the State of Oregon. Do not ride in the back of pickups.

DRIVE DEFENSIVELY! Expect the other person, whether a vehicle operator or a pedestrian, to do the worst thing and be prepared. Observe all speed regulations and traffic signs.

Do not drive when sleepy, taking medication, or when other personal conditions make it unsafe to drive a vehicle. Get someone else to drive or, if alone, stop driving and nap (out of the public view).

Always drive with your headlights on. This practice increases the visibility of your vehicle. It is particularly important when driving in fog, on dusty roads, traveling in and out of shadows, and any other low light/visibility situations. Turn lights off when you park the vehicle.

Do not operate a vehicle in an unsafe condition. Check your vehicle frequently to keep it in good mechanical condition. Lights, horn, steering, and brakes should be kept in proper adjustment at all times. Make necessary repairs as soon as unsafe condition develops. Report any unsafe conditions to your supervisor.

Keep the vehicle clean. Windows, mirrors, and lights should be kept clean and free of obstructions to increase visibility. Keep the cab and driver area clean so material is not rolling under pedals or distracting the driver.

Shift to a lower gear at the beginning of a grade, if the grade is a long, steep descent.

Adjust vehicle speed to the driving conditions. Wet, icy, or snowy roads and decreased visibility require decreased speed. Be aware of speed when changing from one type of road to another, i.e., Freeway to secondary highway to gravel and adjust speed accordingly.

Don't tailgate. Allow at least three seconds of travel distance between yourself and the vehicle ahead. Under slippery road conditions and poor visibility, allow more distance.

Be aware of your vehicle's idiosyncrasies and adjust your driving accordingly.

Be alert for heavily loaded trucks moving at high speeds when driving on privately-owned log-haul roads. Observe all traffic control signs, particularly signs requiring you to drive on the left side of the road.

Back up safely. Walk around your vehicle to check for hazards before backing and use a spotter to guide you.

Do not drive and navigate at the same time. If the driver needs to look at maps and photos, stop at a safe place, then look at them.

Watch for animals on the road. Most hooved animals travel in groups, so where there is one, assume there are many, with all just itching to jump out in front of your vehicle. Stop and let the animal move off the road, look for others to follow, then proceed on. If you can not stop in time to avoid hitting an animal, it is generally better to hit it, than to go off the road or hit another vehicle.

Park the vehicle so that it is not a hazard to other drivers. Do not park where dry grass or other potential fuels can come in contact with your vehicle's hot exhaust system.

Keep as far right as is safely possible on blind curves on logging roads. If the curve is blind and less than two lanes wide, slow way down and be ready to take evasive action.

Yield to uphill vehicles on roads wide enough only for one vehicle.

What to do if injured

Treat the injury promptly. If immediate medical attention is required, go directly to a hospital emergency room. Try to make contact with your supervisor or the office to get instructions and assistance. Make sure the doctor fills out his/her part on the CA-1 form.

Inform your supervisor of all injuries and ask which, if any, forms need to be filled out. Supervisors must inform the office at the earliest opportunity.

Fill out Federal accident forms completely with signatures. ALWAYS make a copy for your personnel records. Give the completed forms to your supervisor. Have the supervisor check your entries mistakes, fill out their section, and forward the completed forms to the appropriate person.

Gather Information. If you are in a multi-vehicle accident, provide the other parties with enough written information so that they can easily get in touch with you, your crew supervisor, and the office. In turn, you must get the following information from all involved parties and witnesses -- names, addresses, phone numbers, vehicle license numbers, driver's license numbers, insurance company names and policy numbers, and police report numbers. If possible, do not admit responsibility without first contacting your supervisor.

E. Plot location aids

Each field crew should have a road map with the location of the plots marked and a plot packet for each plot you may visit. The plot packet for each field plot will generally contain Oc1, Oc2, Oc3, and Oc4 photos, Oc2 and/or Oc3 plot records with plot diagrams, Oc4 computer- printed plot and subplot attribute records, computer-printed Oc3 tree tally records, and a plot review sheet.

Use the road map, plot cards and aerial photos from the previous inventories to locate the plot. The county, plot number, and legal description (township, range, section, and forty) are printed on the plot attribute record. Plot locations are marked and numbered on the road map. Use the road map to reach the general vicinity of the plot by motor vehicle. Once you are within the area covered by the photos, you may use the photos to find the exact plot location on the ground.

Revisited plots

The plot location is pinpricked and circled on the Oc3 photos. The plot number is marked in the upper right-hand corner on the front of the old photo, and on the backside near the circled pinprick. The plot number is also marked on the upper right-hand corner of the new Oc4 (un-pinpricked) photos. For plots visited previously, the Oc2 and 3 plot cards have a section "Route to RP" which may provide information useful for locating the plot.

Plots not previously visited

These plots will have new aerial photos with the field grid location pinpricked on them.

F. Locating the plot on the ground

Locating previously measured plots

When revisiting established plots, use both new and old photos to proceed to the plot area. It is often easier to use the new Oc4 photos to arrive at the general location and the photos from previous inventories to find the exact location of the plot. It is generally easier to locate an established plot by heading directly to the plot rather than to the Reference Point (RP). The reason: the RP is a single tree with a couple of tags, whereas within the plot area are several to many trees with reference tags, tree numbers and/or diameter nails; in short, more "signs" to detect. In searching out the plot, you may find a tagged/numbered tree on one of the subplots--use the plot card from the most recent visit (Oc2 or 3) to determine which subplot you are on.

The RP tree has square aluminum tags on two sides of the tree at 2 meters above ground line, and one square aluminum tag below stump height facing towards the field grid location. If needed, travel notes, remarks, and a description of the RP trees can be found on the front of the Oc2 or 3 plot cards and on the back of the Oc2 or 3 photos. Before beginning the traverse from the RP to the plot, check the photos to see if the azimuth and distance seem reasonable. Some photos will be marked with a point-of-departure (POD). They are usually near a road and indicate how the crew arrived at the plot area.

Some plots in Wasco, Jefferson and Sherman counties were visited in 1995 as a part of the Oregon Demonstration project. The GPS coordinates obtained in that inventory are included in the Oc4 plot packet. If needed, these coordinates can be entered into the GPS unit and used to assist in relocating the plot.

If you have difficulty finding an established plot, follow these steps:

1. Return to the last known point on your route into the plot. Plan a route to the pinpricked field grid location; divide the route into stages with an identifiable physical feature at the end of each stage that you can identify on the photos and can find and confirm on the ground. Proceed stage by stage, never embarking on the next stage until you know without a doubt that you have identified the endpoint of the previous stage. The endpoint on the last stage is the pinpricked location with its referenced trees.
2. If you tracked your way into the plot area but you don't find any signs of the plot, look for stream confluences, ridges, openings, groups of large trees, old skid roads, large snags etc. on the ground, to reconfirm without a doubt that you are at the pinpricked location.
3. Still no plot? Try to locate the area that previous crews might have been when they thought they were at the pinpricked location. Check the Oc3 plot card for information such as:
 - a) Remarks that provide insight on plot location. For example: "Point center moved back 20 feet on same azimuth to agree with photo pinprick."
 - b) Stand type and size of trees. If the plot is in large sawtimber stand of fir, the crew would know they were off if they were in a poletimber stand of pine.
 - c) The size and species of the RP and point 1 reference trees.
 - d) Direction of travel from the RP--it could be 180 degrees off.
 - e) Any other indicator such as slope and aspect.

Locating new plots

1. Locating a plot by inspection: For plots not previously established (i.e. plots without field photos that were pinpricked at the time of previous inventory), use the Oc4 photos to proceed to the pinpricked location by photo interpretation. When you reach the point you believe is the pinpricked location, carefully check the pinpricked field grid location on the Oc4 photos against the surrounding terrain and pattern of tree crowns and vegetation to confirm that the pinpricked location on the photo and your location on the ground are exactly the same spot.
2. Locating a plot with an RP and baseline: You may encounter a plot that is difficult to locate using photo interpretation. In this case you may establish a baseline on the Oc4 photos to determine true photo azimuth and scale. Once the baseline is established:
 - a) Select, tag, pinprick, and record a RP, preferably within 200 meters of the plot. (See page 39).
 - b) On the photos, draw a straight line between the RP and pinpricked location.
 - c) Determine the azimuth and distance from the RP to the referenced subplot.
 - d) Measure out the calculated azimuth and distance to the referenced subplot. Locate the field grid location which is the center of subplot 1 on the standard layout to begin the plot. If a new plot, carefully check the photos against the surrounding terrain and vegetation to make sure you are actually at the field grid location pinpricked on the Oc4 photo.

G. Plots with active logging

If the plot area is being logged (timber is being felled, bucked, or yarded) or is unsafe to visit because of active logging, DO NOT ESTABLISH THE PLOT. Note on the plot jacket the status of the logging operation and return the plot to the supervisor. The supervisor will hold the plot until later in the season, when the status of the logging operation will be checked again to see if the plot can be completed.

H. Access-denied plots

If access is denied to the field grid location or a portion of a plot, see Appendix 6 "Access-denied plots" on page 186.

III. PLOT LAYOUT AND REFERENCING

TABLE OF CONTENTS

III. PLOT LAYOUT AND REFERENCING	17
A. Background: plot layout at previous inventories	17
Occasion 1	17
Occasion 2	17
Occasion 3	17
Occasion 3.5	17
Oregon Demonstration Project.....	17
Forest Health Monitoring Program	17
Occasion 2 and 3 subplot location	18
B. Determining if a plot and its subplots are in inventoried area at Oc4	18
C. Background: plot layout at the current inventory (Oc4).....	18
What type of plot to install at Oc4	19
Timberland zone.....	19
1998 Plots.....	19
1999 Plots.....	19
High-desert zone	19
5-point plot layout diagram	19
D. Plot layout and subplot numbering at Oc4 on plots visited at Oc3	20
1. Revisit ## subplots:.....	20
2. Revisit R# subplots:	20
3. Establish an N# subplot:	20
A special case:	20
4. Revisit X# subplots:	21
5. Replace each substituted (or "substituted and moved") subplot with a N# or C# subplot:	21
The new subplot is a <u>N# subplot</u> if ANY of the following are true:	21
The new subplot is a <u>C# subplot</u> if ALL of the following are true:	21
E. Plot layout and subplot numbering at Oc4 on NEW plots:	24
1. A subplot is a <u>C# subplot</u> if BOTH of the following are true:	24
2. A subplot is a <u>N# subplot</u> if ANY of the following is true:	24
3. If the new <u>plot</u> replaces a 16.95-meter vegetation profile plot:.....	24
F. Nonforest condition classes present on subplots	26
G. Hazardous plots.....	26
1. If all subplots on the standard layout are too hazardous	26
2. If one or more, but not all subplots on the standard layout are too hazardous.....	26
3. If part, but not all of a subplot on the standard layout is too hazardous.....	26
H. Recognizing and mapping condition classes	26
1. Recognize and map condition classes that differ by land class within inventoried area	26
2. Recognize and map condition classes within forest land that differ by broad stand condition	27
The two-class rule	27
Exceptions to the two-class rule	27
3. Recognize and map condition classes within forest land that differ by owner class condition	28
I. Two conditions or one?	29
J. Conditions that can not stand alone	29
K. Identifying boundaries between condition classes	31
1. Distinct boundaries	31
2. Indistinct land class boundaries.....	32
L. Rules for determining condition classes that differ by land class:.....	32
1. Cultural nonforest stringers	32
2. Streams.....	32
3. Maintained structures.....	32
4. Stringers and Necks.....	32
5. Intermingled forest and other natural vegetation	33
6. Forest land amputated by a cultural nonforest stringer	33
M. Rules for determining forest condition classes that differ by stand condition	34

1. Stringers and Necks.....	34
2. Intermingled stand conditions	35
3. Forest land amputated by a cultural nonforest stringer	36
N. Rules for determining forest condition classes that differ by owner class condition.....	37
1. Subdivide only condition classes previously defined by GLC and stand condition classes...	37
2. Subdivide conditions when a property boundary between two different owner class categories is present.....	38
3. Subdivide only forested conditions.....	38
4. Subdivide ownership class conditions only when a distinct boundary is visible on the ground	39
O. Referencing the plot	39
1. Referencing a plot visited previously.....	39
Referencing a lost plot	39
2. Referencing plots not visited previously	40
3. An exception.....	40
4. The reference point (RP)	40
5. Referencing the cedar stake	41
P. Referencing the other subplots on the standard layout	41
1. Mark subplot center.	41
2. Select reference trees.....	41
3. Tag the reference trees.....	42
4. Record data about the reference trees	42
Q. Recording reference tree data (all subplots on the standard layout)	42
1. If a tally tree.....	42
2. If not a tally tree.....	42

III. PLOT LAYOUT AND REFERENCING

A. Background: plot layout at previous inventories

In the late 1950s, PRIME generated a grid of field locations across all lands in eastern Oregon. This was done on USGS map or other available map coverage. To generate the grid on these maps, a point was selected randomly, and from this point grid lines were mapped out on cardinal directions every 3.4 miles. The intersections of these east-west and north-south lines on the maps became the basis for locating field plots on the ground in all PRIME inventories since the late 1950s. In some cases, the grid was drawn county by county, and errors caused gaps or concentrations in the grid where the lines did not match up along county boundaries.

Occasion 1

All eastern Oregon counties were assigned to one of two administrative units, the central unit or the Blue Mountain unit. The counties and their units are listed on page 55. BLM lands were included in the Oc1 inventory, as were lands in the Klamath Indian Reservation, now known as the Winema National Forest. The central unit was measured in 1964 and timberland plots were established using a 1-acre, 10-point plot. In 1969, the Blue Mountain unit was measured and about 194 timberland plots were established using the same plot design.

Occasion 2

At Oc2 the "timberland zone" was designated. It encompassed parts of both the central and Blue Mountain units, and was designed to include all areas of timberland. It also included some surrounding and intermingled areas of other forest and non-forest lands. In both units, only plots (both timberland and some other forest) within the timberland zone were measured. BLM lands were excluded from this inventory. The central unit was measured in 1977. Three of the Oc1 10-points were remeasured and a new 2.5 hectare, 5-point plot was installed. The Blue Mountain unit, also measured in 1977, was a "walk-through" inventory, all Oc1 10-point plots were revisited, and previously tallied trees on the fixed- and variable-radius plots were classified as living, mortality or cut.

Occasion 3

BLM lands were included in the Oc3 inventory. In both units, all timberland and other forest plots within the timberland zone were measured. Outside of the timberland zone other forest (juniper, oak, and chaparral) plots were established on a 6.8 mile (11 k) grid (1/4 of the normal intensity). In the central unit, measured in 1986-1987, 1/3 of the timberland zone plots were remeasured, the other 2/3s were "walk-throughs". The new non-timberland zone plots were established using the 2.5 hectare, 5-point plot. In 1987 in the Blue Mountain unit, the 5-point plot was used to replace the Oc2 10-point plots in the timberland zone, and to establish the new plots in the non-timberland zone.

Occasion 3.5

In 1992, all of the timberland and other forest-low site plots were revisited. Previously tallied variable and fixed-radius plot trees were assigned a tree history (living, cut or mortality), evaluated for damaging agent. Root disease was mapped.

Oregon Demonstration Project

In 1995, about 15 of the plots in Wasco, Jefferson and Sherman counties were visited as a part of a cooperative study with the USDA Natural Resources Conservation Service. The data collected included GPS coordinates and written plot descriptions. Plot referencing and land class were updated.

Forest Health Monitoring Program

In 1997, forest health monitoring (FHM) plots were installed at the grid locations on 115 of the plots in eastern Oregon. About 30 of these plots will be revisited during each subsequent summer. On FHM plots tree, vegetation, lichens, ozone, and soils data are collected. FHM plots are 4 - 7.32 m fixed-radius points laid out with points at 36.6 meters at 360, 120, and 240 degrees and from point 1. Point 1 of this plot is at the same location as point 1 of the FIA plot.

Occasion 2 and 3 subplot location

Usually, the 5-subplots on the FIA plots installed in the Central unit at Oc2 and the Blue Mountain unit at Oc3 were laid out in the standard pattern diagrammed on page 19 (the old 10-point plot is diagrammed on page 188). However, subplots were installed at positions off the standard pattern in order to keep all 5 subplots entirely within the same forest land class and stand condition (broad forest type and stand size); i.e., subplots were never split between forest and nonforest land or between different stand condition classes.

The location of subplots that were not on the standard pattern was determined one of two ways. 1) A substitute subplot location (a "**substituted subplot**") was adopted if the center of the standard subplot location was in different forest land class or forest condition than was present at the field grid location. 2) If the subplot center was in the same forest land class and forest condition class as the field grid location but was within 16.95 meters of a different land class or forest condition class, the standard subplot center was moved (a "**moved subplot**") until 16.95 meters inside the same forest land class and forest condition present at the field grid location. On plots where a BAF 20 factor prism was used, subplots may have been "moved" as far as 20.76 meters.

At Oc3, a single 16.95-meter fixed-radius plot for sampling the vegetation profile was installed at field grid locations that fell in forest land classified as other forest-rocky, chaparral, or unsuitable site (GLCs 41, 45, 46) or were at locations that ordinarily required a 5-subplot plot but were too hazardous (cliffs etc.) to allow its installation.

B. Determining if a plot and its subplots are in inventoried area at Oc4

The following rules apply:

1. If the field grid location is outside inventoried area (i.e., is on land administered by the National Forest System or on Census water), the entire 5-subplot plot (or one-subplot plot) is out of the inventory. Write up why the field grid location is out of inventory in "Contact Office About" on the Plot Record and return the plot to the crew coordinator.
2. If the field grid location is within inventoried area, then look at subplots 2 through 5 on the standard layout. Each of these subplots (2 through 5) is in the inventory only if its subplot center is within inventoried area; if the subplot center is outside inventoried area, the entire subplot is out of inventory and the out of inventory condition class is assigned a sample kind of a 0. Write the reason why the subplot is out of the inventory in "Contact Office About" on the Plot Record. R and X subplots are remeasured only if their subplot center is in inventoried area and the subplot center on the standard layout from which they were moved at Oc3 is also still in inventoried area.
3. If a subplot center is within inventoried area but part of the subplot within its 16.95-meter fixed-radius plot is outside inventoried area, at least two condition classes are present and should be mapped: one condition is the mapped area outside the inventory, and the other class (or classes) is inventoried area. The mapped condition class outside inventoried area is assigned a sample kind of 0. This instruction applies for both subplots on the standard layout and for R and X subplots.

C. Background: plot layout at the current inventory (Oc4)

In the current (Oc4) inventory, two different plot designs will be used. Both designs are laid out in their standard pattern across condition classes to collect data about the current status of forest resources.

At Oc4 the "timberland zone" will be used again. The timberland zone was first designated at Oc2 and encompassed parts of both the central and Blue Mountain units. It was designed to include all areas of timberland. It also included some surrounding and intermingled areas of other forest and non-forest lands.

What type of plot to install at Oc4

Timberland zone

All plots within the timberland zone will be measured across condition classes using the 5-point design used at Oc3. Each of these plots is based on this standard 5-subplot design unless access is denied on all 5 subplots or all 5 subplots are too hazardous (if access is denied on one or more subplots, see Appendix 6 on page 186; or if too hazardous, see page 26). The condition class present at the field grid (pinpricked) location, which is the center of subplot 1, is always condition class 1.

1998 Plots

The plot will be installed during the 1998 field season using the procedures described in this field manual if any of the following are true:

1. an Oc3 plot with a GLC of 20, 41, 49, 46 was installed at the grid location, OR
2. a forest or other-forest condition class with a GLC of 20, 41, 46, or 49 is present within the boundaries of any of the 16.95 meter radius subplots, OR
3. only nonforest condition classes (GLC 63-92) are present on all of the 16.95 meter radius subplots.

For forest land condition classes recognized within the 16.95-meter fixed-radius plot on each standard subplot, live trees and snags are selected using fixed and variable-radius selection, subplot and condition class attributes are recorded, cwd and crown cover are estimated using line sampling, and vegetation profile is assessed. (Veg profile is done only for the condition class present at subplot center).

1999 Plots

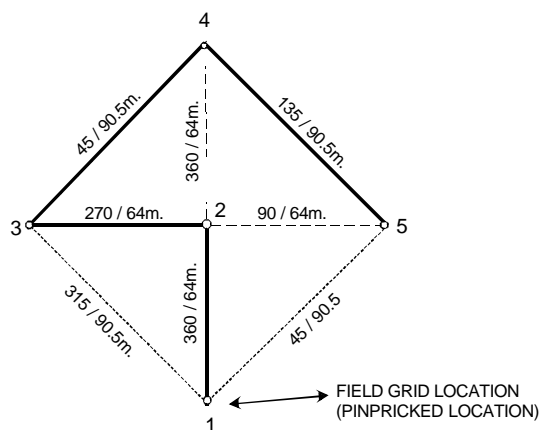
If no timberland condition classes are present within the boundaries of any of the 16.95 meter radius subplots, but an other-forest (GLC 43, 44, 45, 50) condition class is present, the plot will be installed in 1999 using the 5-point design and a set of field procedures not described in this manual. If a plot of this type is encountered during the 1998 season, it will be revisited. Make a note on the plot jacket and the plot card explaining the circumstances. Inform the landowner if feasible.

High-desert zone

In the Oc4 inventory, plots in the **high-desert zone** (all area outside of the timberland zone) will be laid out with a 4-point plot design using fixed-radius plots for tree selection. Plots of this design **will not** be measured during the 1998 field season. The procedures for these plots are not covered in this field manual.

5-point plot layout diagram

The standard 5-point plot layout used for the current timberland zone inventory and for some (see page 18) previous eastern Oregon inventories:



D. Plot layout and subplot numbering at Oc4 on plots visited at Oc3

Do the following steps:

1. Revisit ## subplots:

A subplot is a ## subplot if **ALL** of the following are true:

- a) The subplot center is on the standard layout, **AND**
- b) The subplot center is in condition class 1, **AND**
- c) The subplot was established at Oc3, **AND**
- d) The subplot was part of a plot measured at Oc3 which has an Oc3 GLC of 20 or 49.

All condition classes present on the subplot (within the 16.95-meter fixed-radius plot) are mapped on the subplot diagram. If condition class 1 is still GLC 20 or 49, trees and snags tallied at Oc3 are remeasured, and new live trees (tree histories 2, 4 and 6) and snags (tree history 7) are tallied in condition class 1, and reconstructed if ≥ 2.5 cm. d.b.h. and a tree history of 2 or 6. Live trees and snags are tallied, but not reconstructed, (see definition on the next page) in all other mapped forest condition classes except classes with a GLC of 45.

2. Revisit R# subplots:

A subplot is a R# subplot if **ALL of the following are true:**

- a) The subplot was "moved" at Oc3 from a subplot location on the standard layout, **AND**
- b) The "moved" subplot center is in condition class 1, **AND**
- c) The subplot center on the standard layout off of which the subplot was moved is in condition class 1, **AND**
- d) The subplot was part of a plot measured at Oc3 which has an Oc3 GLC of 20 or 49.

All condition classes present on the subplot are mapped on a supplemental subplot diagram sheet. Within condition class 1, trees, snags and vegetation profile data tallied at Oc3 are remeasured, and new live trees (tree histories 2, 4 and 6) and snags (tree history 7) are tallied in condition class 1 and reconstructed if ≥ 2.5 cm. d.b.h. and a tree history of 2 or 6. These data are not remeasured or collected in other condition classes mapped on a R# subplot. CWD and tree cover data are not collected on R# subplots. Also do the following step.

3. Establish an N# subplot:

Establish an N# for each subplot "moved" off of the standard layout at Oc3; do so regardless of whether the "moved" subplot qualifies as an R# subplot at Oc4: Establish a new subplot at the subplot center on the standard layout off of which the subplot was "moved" at Oc3. The new subplot is an N# subplot. All condition classes present on the subplot are mapped on the subplot diagram. Trees and snags are tallied, but not reconstructed, in all mapped forest condition classes (including condition class 1) except classes with a GLC of 45.

A special case:

If **ALL** of the following are true:

- a) A subplot center that was moved at Oc3 is not in condition class 1, **AND**
- b) The subplot center (on the standard layout) off of which the moved subplot was located, is in condition class 1, **AND**
- c) Condition class 1 is forest land with a GLC of 20, or 49 at Oc3 and Oc4, **AND**
- d) Condition class 1 has not been clearcut since Oc3,...

THEN,

Ignore step 3 and establish a C# subplot at the subplot location on the standard layout off of which the moved subplot was located at Oc3. The moved subplot is not revisited. All condition classes present on the C# subplot are mapped on the subplot diagram. Live trees and snags are tallied in all mapped forest condition classes except classes with a GLC of 45. Live trees ≥ 2.5 cm. d.b.h. are reconstructed in condition class 1. Trees live at Oc3 and ≥ 2.5 cm. d.b.h. but now culturally killed or dead of natural causes are tallied and reconstructed in condition class 1. Trees live at Oc3 and ≥ 12.5 cm. d.b.h. but now harvested also are tallied and reconstructed in condition class 1.

4. Revisit X# subplots:

A subplot is a X# subplot if **ALL** of the following are true:

- a) The subplot was "substituted" (or "substituted and moved") at Oc3 from a subplot location on the standard layout, **AND**
- b) The "substituted" (or "substituted and moved") subplot center is in condition class 1, **AND**
- c) The subplot was part of a plot measured at Oc3 which has an Oc3 GLC of 20 or 49.

All condition classes present on the subplot are mapped on a supplemental subplot diagram sheet. Within condition class 1, trees, snags and vegetation profile data tallied at Oc3 are remeasured, and new live trees (tree histories 2, 4 and 6) and snags (tree history 7) are tallied in condition class 1 and reconstructed if ≥ 2.5 cm. d.b.h. and a tree history of 2 or 6. These data are not remeasured or collected in other condition classes mapped on a X# subplot. CWD and tree cover data are not collected on X# subplots. Also do the following step.

5. Replace each substituted (or "substituted and moved") subplot with a N# or C# subplot:

An Oc3 subplot that was substituted (or "substituted and moved") at Oc3 is replaced with a new subplot located on the standard layout.

The new subplot is a N# subplot if **ANY** of the following are true:

- a) The condition class at subplot center is not in condition class 1 (this includes a subplot center that was in the same condition class as the field grid location at Oc3, but is not in condition class 1 at Oc4), **OR**
- b) The subplot center is in condition class 1 but condition class 1 is nonforest land with a GLC of 63-92 at Oc4, **OR**
- c) The subplot center was in a condition class with a GLC of 63-92 at Oc3, and the subplot center is in condition class 1 with a GLC 20 or 49 at Oc4, **OR**
- d) The subplot center is in condition class 1 with a GLC of 20 or 49 at Oc3 and Oc4, but condition class 1 has been clearcut since Oc3, **OR**
- e) The subplot center is in condition class 1 but was not in what was condition class 1 at Oc3 and the GLC at subplot center at Oc3 and Oc4 is 20 or 49.

On N subplots, all condition classes present on the subplot are mapped on the subplot diagram. Trees and snags are tallied, but not reconstructed, in all mapped forest condition classes except those with a GLC of 45; (this includes condition class 1 which can be present on the subplot elsewhere than at subplot center).

The new subplot is a C# subplot if **ALL** of the following are true:

- a) Subplot center is in condition class 1, **AND**
- b) Condition class 1 is forest land with a GLC of 20 or 49 at Oc3 and Oc4, **AND**
- c) Condition class 1 has not been clearcut since Oc3, **AND**
- d) The subplot should have been installed and trees tallied at Oc3 but was not.

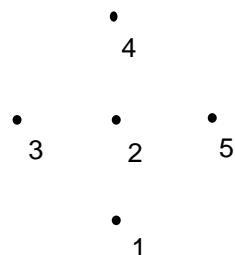
On C subplots, all condition classes present on the subplot are mapped on the subplot diagram. Live trees and snags are tallied in all mapped forest condition classes except those with a GLC of 45. Live trees ≥ 2.5 cm. d.b.h. are reconstructed in condition class 1. Trees live at Oc3 and ≥ 2.5 cm. d.b.h. but now culturally killed or dead of natural causes are tallied and reconstructed in condition class 1. Trees live at Oc3 and ≥ 12.5 cm. d.b.h. but now harvested also are tallied and reconstructed in condition class 1. Snags tallied are not reconstructed.

"Reconstruct" means that trees sampled live and ≥ 2.5 cm. d.b.h. are backdated to estimate Oc3 crown ratio and crown class, and d.b.h. is also backdated currently ≥ 12.5 cm. Additionally, when required, trees culturally-killed, dead of natural causes, or harvested that were live at Oc3 are sampled and backdated to estimate Oc3 d.b.h., crown ratio and class, and several other Oc3 attributes; these trees must be ≥ 2.5 cm. d.b.h. to be tallied as a culturally killed tree (tree history 3) or a tree dead of natural causes (tree history 5) and must be ≥ 12.5 cm. d.b.h. to be tallied as a harvested tree (tree history 8).

Examples: Plot layout and subplot numbering at Oc4 on plots visited at Oc3

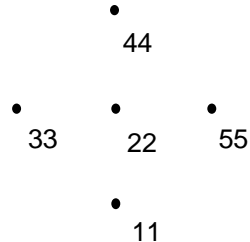
EXAMPLE 1:

OC3:



PLOT AREA IS ALL
TIMBERLAND IN ONE
CONDITION CLASS

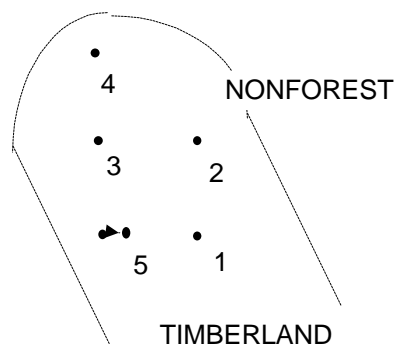
OC4:



PLOT AREA IS STILL ALL
TIMBERLAND IN ONE
CONDITION CLASS
(CC1)

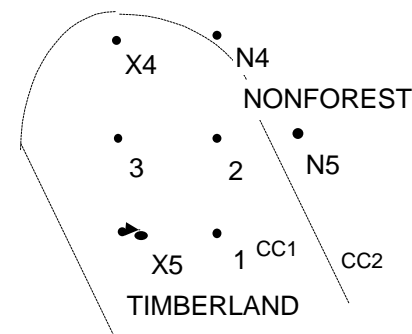
EXAMPLE 2:

OC3:



SUBPLOTS 4 & 5 WERE
SUBSTITUTED TO KEEP
ALL SUBPLOTS IN THE
TIMBERLAND

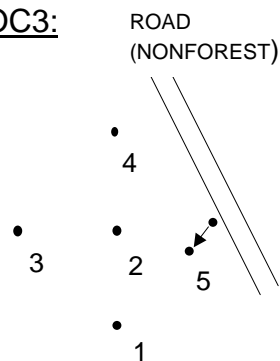
OC4:



OC3 SUBPLOTS 4 & 5
ARE REPLACED BY N4 &
N5 AND REMEASURED
AS X4 & X5

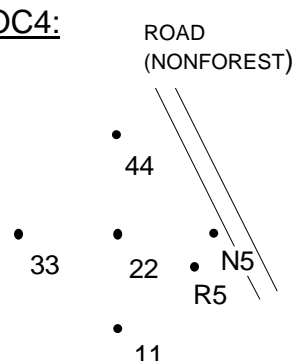
EXAMPLE 3:

OC3:



SUBPLOT 5 WAS MOVED
AWAY FROM ROAD TO BE
ENTIRELY IN TIMBERLAND.
PLOT AREA IS ALL THE
SAME CONDITION EXCEPT
FOR THE ROAD.

OC4:



ALL SUBPLOT CENTERS
ARE IN THE SAME
CONDITION CLASS (CC1).
OC3 SUBPLOT 5 IS
REMEASURED (R5). N5 IS
NOT RECONSTRUCTED.

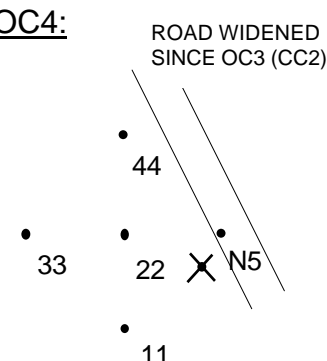
EXAMPLE 4:

OC3:



SUBPLOT 5 WAS MOVED
AWAY FROM ROAD TO BE
ENTIRELY IN TIMBERLAND.
PLOT AREA IS ALL THE SAME
CONDITION EXCEPT FOR THE
ROAD.

OC4:

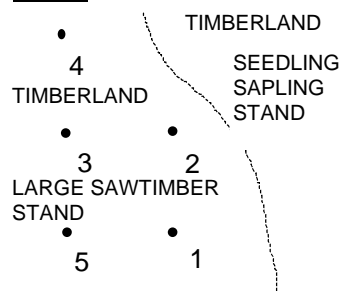


CENTER OF N5 IS IN THE ROAD
(CC2). TREES IN CC1 ON N5 ARE
NOT RECONSTRUCTED. OLD
MOVED OC3 SUBPLOT 5 IS NOT
REVISITED BECAUSE THE
CENTER OF N5 IS IN CC2.

Examples: Plot layout and subplot numbering at Oc4 on plots visited at Oc3

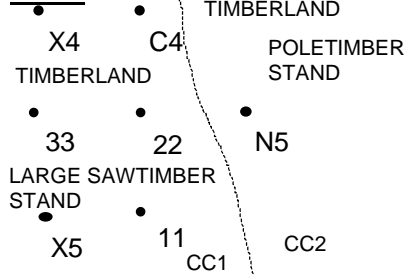
EXAMPLE 5:

OC3:



SUBPLOTS 4 & 5 WERE SUBSTITUTED TO KEEP ALL OC3 SUBPLOTS IN ONE CONDITION CLASS.

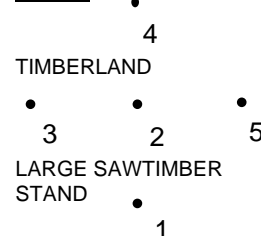
OC4:



OC4 CREW DECIDES THAT THE STANDARD LOCATION FOR SUBPLOT 4 IS IN CONDITION CLASS 1 SO SUBPLOT IS C4.

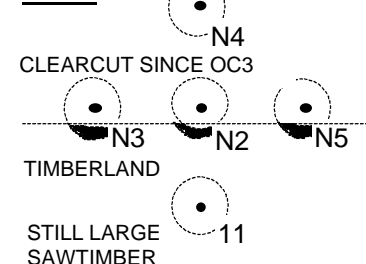
EXAMPLE 6:

OC3:



ENTIRE PLOT AREA IS IN ONE CONDITION CLASS AT OC3.

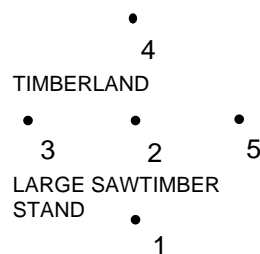
OC4:



CIRCLES ARE 16.95 m FIXED RADIUS PLOTS. NEW TREES SELECTED IN SHADED AREAS (N2,N3,N5) ARE **NOT** RECONSTRUCTED.

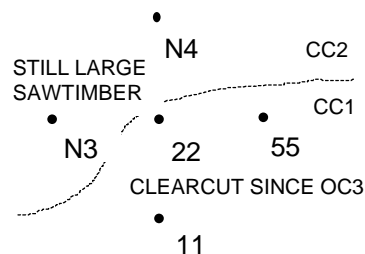
EXAMPLE 7:

OC3:



ENTIRE PLOT AREA IS IN ONE CONDITION CLASS AT OC3.

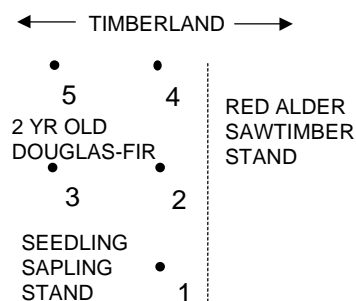
OC4:



TWO TIMBERLAND CONDITION CLASSES AT OC4

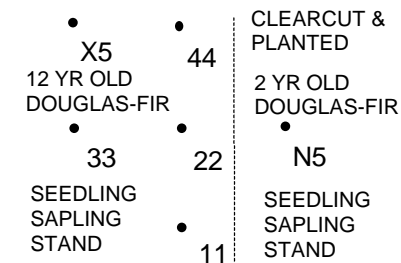
EXAMPLE 8:

OC3:



SUBPLOT 5 WAS SUBSTITUTED TO KEEP ALL OC3 SUBPLOTS IN ONE CONDITION CLASS.

OC4:



STILL TWO CONDITION CLASSES. THIS IS A SPECIAL CASE COVERED ON PAGE 27.

E. Plot layout and subplot numbering at Oc4 on NEW plots:

A new 5-subplot plot of standard layout is established at Oc4 if ANY of the following situations is true:

- a) An Oc3 5-subplot plot can not be found, (a "lost" plot with an Oc3 GLC of 20, 41, 46, or 49) forest land is present, **OR**
- b) A field grid location was out of inventoried area at Oc3 but is now within inventoried area, and forest land is present, **OR**
- c) A field grid location was missed at Oc3 and forest land is present, **OR**
- d) The GLC of a field grid location is 41 or 46, and a single 16.95-meter fixed-radius vegetation plot was established at Oc3, **OR**
- e) A plot was classified as nonforest at Oc3 but forest land is present.

The phrase "...forest land is present" means that a forest land condition class is present on the 16.95-meter fixed-radius plot of at least one subplot on the standard plot layout.

On new plots, each subplot on the standard layout is established if one or more forest land condition class is present within the subplot's 16.95-meter fixed-radius plot. If a forest land condition class is present within the subplot's 16.95-meter fixed-radius plot, the subplot is established.

Instructions for installing a new subplot on the standard layout:

1. A subplot is a C# subplot if BOTH of the following are true:

- a) subplot center is in condition class 1, **AND**
- b) condition class 1 is forest land with a GLC of 20 or 49 at Oc3 and Oc4

All condition classes present on the subplot are mapped on the subplot diagram. Trees are tallied in all mapped forest condition classes except classes with a GLC of 45. Live trees ≥ 2.5 cm. d.b.h. are reconstructed in condition class 1. Trees live at Oc3 and ≥ 2.5 cm. d.b.h. but now culturally killed or dead of natural causes are tallied and reconstructed in condition class 1. Trees live at Oc3 and ≥ 12.5 cm. d.b.h. but now harvested also are tallied and reconstructed in condition class 1.

2. A subplot is a N# subplot if ANY of the following is true:

- a) The condition class at subplot center is not in condition class 1, **OR**
- b) Subplot center is in condition class 1, and condition class 1 has a GLC of 20 or 49 at Oc3 and Oc4, but was clearcut since Oc3, **OR**
- c) Subplot center is in condition class 1, and condition class 1 has a GLC of 41, 46, or 60 through 92 at Oc4, **OR**
- d) Subplot center is in condition class 1, and condition class 1 had a GLC of 60 through 92 at Oc3, and condition class 1 has a GLC of 20, 41, 46, or 49 at Oc4.

All condition classes present on the subplot are mapped on the subplot diagram. Trees and snags are tallied, but not reconstructed, in all mapped forest condition classes except classes with GLC 45.

3. If the new plot replaces a 16.95-meter vegetation profile plot:

If the new plot replaces an Oc3 single 16.95-meter fixed-radius vegetation profile plot, the Oc3 vegetation profile is reassessed on the 16.95-meter plot within condition class 1 if subplot center is in condition class 1, and condition class 1 is forest land (see page 81). The 16.95-meter fixed-radius plot gets a subplot number "11" and the reassessment is recorded in the Husky. The 5 new subplots are recorded on the data recorder and are laid out and numbered (C and N subplots) like any other new 5-subplot plot on the standard layout (see the previous page). A new 2.41-meter fixed-radius vegetation profile plot is taken at each of the 5 new subplots whose subplot center is forest land (see page 81).

Examples: Plot layout and subplot numbering at Oc4 on new plots

EXAMPLE 1:

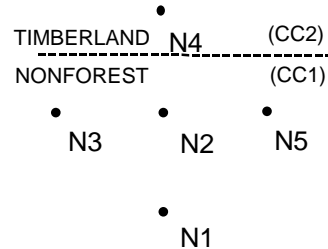
OC3:



✕ ← FIELD GRID LOCATION

THE PLOT AREA WAS CLASSIFIED NONFOREST. NO SUBPLOTS WERE ESTABLISHED AT OC3.

OC4:



EXAMPLE 2:

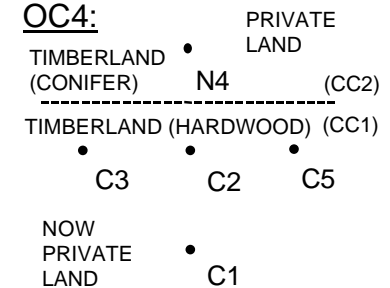
OC3:



• ← FIELD GRID LOCATION

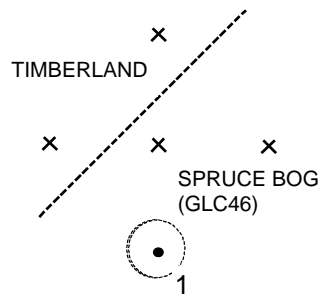
FIELD GRID LOCATION FELL IN NATIONAL FOREST AT OC3, SO THE ENTIRE PLOT WAS "OUT OF

OC4:



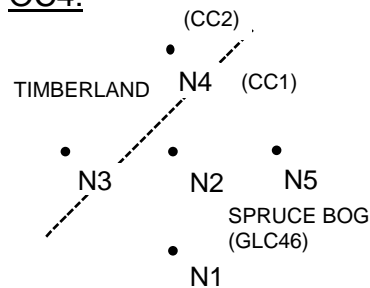
EXAMPLE 3:

OC3:



A 1 SUBPLOT PLOT WAS ESTABLISHED AT THE FIELD GRID LOCATION AT OC3 (17-M VEG PROFILE PLOT)

OC4:



THE OC3 VEG PROFILE PLOT IS REMEASURED AND NUMBERED 11. IT IS THEN REPLACED WITH N1.

F. Nonforest condition classes present on subplots

On all visited plots, map all nonforest condition classes present on the 16.95-meter fixed-radius at each subplot on the standard layout and at each R and X subplot. Do not combine nonforest condition classes present. Example: if nonforest--urban land and nonforest--cropland are both present within a 16.95-meter fixed-radius plot, map each land class as a separate condition class.

G. Hazardous plots

A plot or subplot is hazardous according to the crew's judgment.

1. If all subplots on the standard layout are too hazardous

Install, or remeasure a single 16.95-meter fixed-radius vegetation profile plot at the field grid location if the field grid location falls in a forest land condition class in inventoried area (also see page 81).

2. If one or more, but not all subplots on the standard layout are too hazardous

Install or remeasure all standard layout subplots, R subplots, and X subplots that are safe within their 16.95-meter fixed-radius plot. If one or more subplots on the standard layout have subplot centers that fall in a forest land condition class that is in inventoried area, but all of the subplots in that condition class are too hazardous to establish or remeasure, then install, or remeasure a 16.95-meter fixed-radius vegetation profile plot at the lowest-numbered subplot center on the standard layout that is in the condition class (also see page 81).

3. If part, but not all of a subplot on the standard layout is too hazardous

Follow normal field instructions to the extent safely possible to establish or remeasure the portion of the subplot that is not hazardous. For the hazardous portion estimate and record, as best possible, condition class boundaries, "in" trees, snags, and their required data elements (tree history, condition class, species, d.b.h., height...), vegetation profile, cwd/cover transects, and nonforest inclusion. Write up what you encountered and were able to actually measure, rather than "rough-in" by estimation.

H. Recognizing and mapping condition classes

Plot area recognized as within inventoried area is divided into condition classes. The area within each subplot's 16.95-meter fixed-radius plot is mapped by condition class. Condition classes are defined by differences in land class and, within forest land classes, by differences in broad forest type, stand size, tree stocking class, and harvest since Oc3. The condition class in which the field grid location lies (the center of subplot 1) is always condition class 1. While most subplots encompass only one condition class, some will have two or more classes within their 16.95-meter plot.

Condition classes present on one or more 16.95-meter plots which do not have a subplot center on the standard layout located within the class are called "slivers".

Condition classes are determined in three steps:

1. Recognize and map condition classes that differ by land class within inventoried area

If a subplot is divided between forest and nonforest land within inventoried area, these land classes define separate condition classes. If more than one land class is present, each will be recognized as a separate condition class. To be a condition class because of land class, the condition class must be, in most cases, at least 0.4 hectares in area and 35 meters wide but some exceptions do apply and are covered in rules for land classification on page 32. Inclusions of land less than these minimums are lumped as part of the most similar adjacent land class.

Recognize forest and nonforest condition classes regardless of whether they are delineated by distinct boundaries or phase from one class to the next along an indistinct boundary. Distinct and indistinct boundaries are discussed elsewhere in this section.

To separate Other Forest Low Site (GLC 49) from Timberland (GLC 20) see Appendix 3C.

2. Recognize and map condition classes within forest land that differ by broad stand condition

Forest land stand condition is defined by broad forest type, stand size, broad stocking class, and harvesting since previous (Oc3) inventory. If a condition class defined by a forest land class of GLC 20, 41, 44, 46, or 49 is divided by two or more distinct differences in broad stand condition, then recognize each stand condition as a separate condition class. For a forest condition class to be divided into two or more condition classes on the basis of differences in stand conditions, each prospective stand condition class must be at least 2.5 hectare in area and at least 35 meter wide, and pass the "two-class" difference criteria (see next page and page 34). Additionally, each prospective stand condition must be distinct from adjacent stand conditions and must be separated from these adjacent conditions by distinct, well-defined boundaries. Do not divide a condition class with a GLC of 43, 45 or 50 because differences in stand condition.

Recognize two separate forest land stand condition classes if a distinct boundary is crossed between:

- a) **Broad forest types:** Hardwood type and conifer type, or hardwood type and mixed conifer-hardwood type, or conifer type and mixed conifer-hardwood type, or any of the preceding types and nonstocked forest land.
- b) **Stand sizes:** Stand size classes are large sawtimber, small sawtimber, poletimber, seedling-sapling stand, nonstocked area. The two-class difference criteria applies (see "The two class rule") Examples of valid differences: a sawtimber stand next to a seedling-sapling stand, a large sawtimber stand next to poletimber stand, nonstocked forest land next to a 2 year old seedling stand.
- c) **Broad stocking class:** Stocking classes are overstocked, adequately stocked, understocked, nonstocked. The two-class difference criteria applies (see "The two class rule")
- d) **Harvested and undisturbed forest land:** Separate forest land heavily partially harvested since Oc3 from forest land undisturbed since Oc3. Separate forest land clearcut since Oc3 from partially harvested (since Oc3) or undisturbed (since Oc3) forest land. See page 63 for harvest definitions.

Separate adjacent stand condition classes often coincide with differences in physioclass such as: (a) steep north slope versus steep south slope, (b) swampy flat vs. well-drained upland, (c) deep-soiled flat vs. thin-soiled upland.

The two-class rule

A "two class difference" rule generally applies when deciding if an area should be kept whole or divided between two stand sizes or two stocking classes. The rule is that a two-class difference must be present between stand size classes present or between stocking classes present in order to split the area into two condition classes because of stand size or stocking class differences. Two examples: 1) A small diameter sawtimber stand is next to a sapling stand: recognize two condition classes because the small sawtimber stand is two classes different from the sapling stand (small sawtimber-poletimber-sapling); 2) A poletimber stand is next to a small sawtimber stand: treat the two stands as all one condition class because the two stands are only one class different.

Exceptions to the two-class rule

The two-class rule should be ignored when dealing with timberland or low-site other forest land clearcut or heavily partially harvested since Oc3 that is adjacent to a seedling-sapling stand (and both stands are of the same land class). The two-class rule also should be ignored when a stand predominately of saplings and less than 15 years old (total age) is adjacent to a stand that poletimber-size or larger. In these particular cases, two condition classes should be recognized and mapped if each meets minimum area and width rules and is delineated by a distinct boundary.

This exception is needed to evaluate silvicultural opportunities that may differ between these very young-growth conditions. To illustrate: in a 2 year-old seedling stand or in a recent clearcut, we want to evaluate whether the area has been adequately restocked or needs site preparation and planting, whereas in a 10+ year-old sapling stand, the focus is on overstocking (precommercial thinning), nonstocked inclusions (plant openings), and competing non-tree vegetation (clean and release). If two condition classes are recognized, each will require 5 stocking plots provided it is not a sliver (see page 155).

3. Recognize and map condition classes within forest land that differ by owner class condition

In some cases, differences in owner class will define additional conditions. Within the forested condition classes already delineated in steps 1 and 2 above, separate condition classes are recognized if a distinct boundary between owner classes in two of the different categories listed below is present. To be a separate condition based on ownership class, the owner class condition must be 0.4 hectares in size. To separate one forested condition into two conditions, the ownership boundary must be distinct and visible on the ground, and the owner class of each portion must be discernible at the plot location (using fences, signs, etc, not through visiting the courthouse).

Recognize separate owner class conditions if a distinct, recognizable boundary is crossed between two of the following six owner class categories:

- 12 BLM - available

- 51 Other private - available

- Forest industry

- 21 Forest industry with mills

- 71 Forest industry without mills

- Other public - available

- 14 Other federal - available

- 15 State - available

- 16 County and municipal available

- Reserved

- 7 Other federal - reserved

- 8 Other private - reserved

- 9 Native American - reserved

- 10 BLM - reserved

- 18 State - reserved

- 19 County and municipal - reserved

- 800 Native American - available

I. Two conditions or one?

Prospective condition classes that are identical in ground land class and, if forest land, identical in stand condition and owner class condition are mapped and treated as one condition class except in situations where real change in ground land use or stand condition(s) has occurred since Oc3.

Examples:

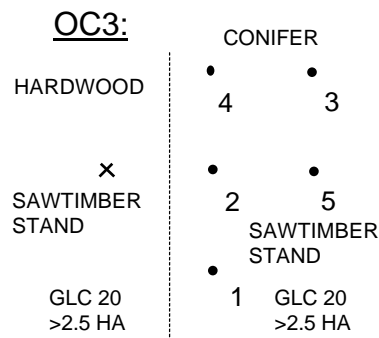
- 1) A constructed road and a railroad are adjacent to one another within mapped area on subplot N1: map the road and railroad as one condition class and assign a ground land class of 66.
- 2) A county road is mapped on subplot N1, and a state highway is mapped on subplot N5: both roads are treated as parts of the same condition class which has a ground land class of 66 (nonforest land: cultural nonforest stringer).
- 3) On subplot 11, subplot center falls in a constructed road. At Oc3, the subplot was timberland. On subplot N3, a constructed road built before Oc3 is mapped. The two roads are mapped and recorded as two separate condition classes each having a GLC of 66.
- 4) Subplots 22 and 44 are entirely within well-stocked stands of Douglas-fir poletimber. A State highway runs east-west halfway between these subplots. The two stands are treated as one condition class.

J. Conditions that can not stand alone

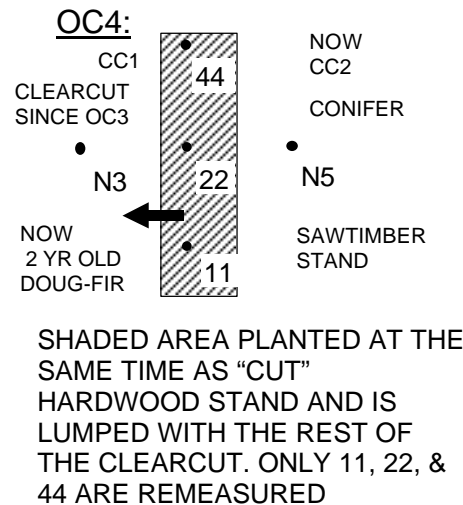
This section applies to any area that was part of a valid condition class at Oc3 but, due to change, is too small in area or no longer meets area classification rules to be recognized as a separate condition class at Oc4. Lump an area that no longer can stand alone as separate condition class with the most similar adjacent condition class. This includes combining two conditions too small to be mapped as separate condition class, into one larger polygon that meets land class and stand condition minimum requirements. Occasionally, a prospective condition will be surrounded entirely by other condition classes that are of other GLCs, and, provided that the "surrounded" condition is at least 0.4 hectares and 35 meters wide, it stands as a valid condition class even if less than 2.5 hectares in size. Examples are illustrated on the next page.

Examples: Conditions that can not stand alone

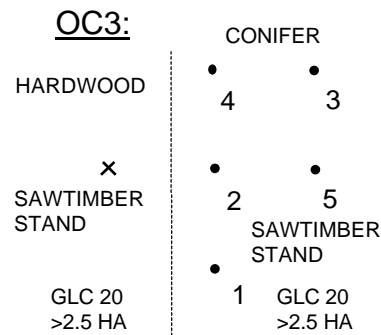
EXAMPLE 1:



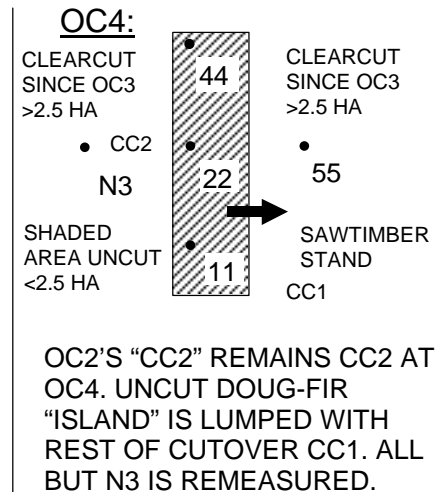
SUBPLOT 3 WAS SUBSTITUTED TO KEEP ALL OC3 SUBPLOTS IN ONE CONDITION CLASS.



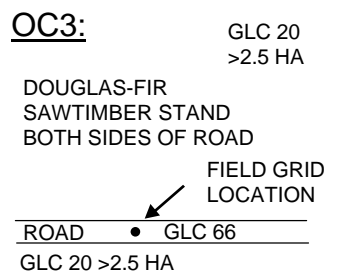
EXAMPLE 2:



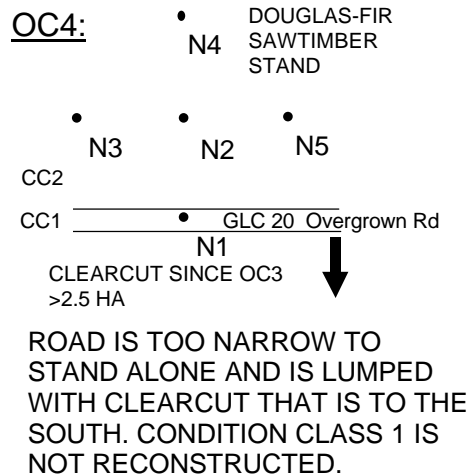
SAME SITUATION AS EXAMPLE 1 AT OC3.



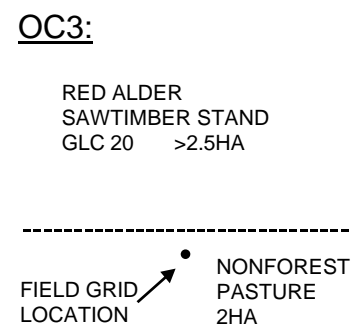
EXAMPLE 3:



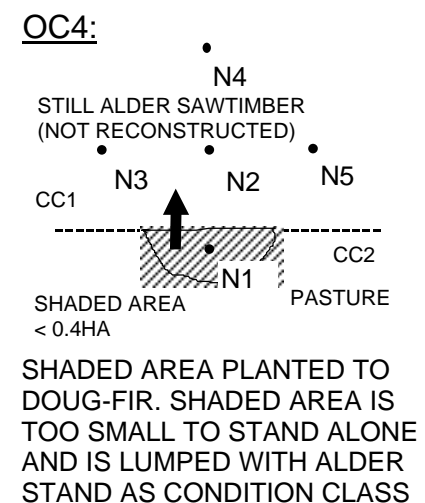
FIELD GRID LOCATION IS IN A NONFOREST ROAD. NO SUBPLOTS ESTABLISHED.



EXAMPLE 4:



FIELD GRID LOCATION IS IN A NONFOREST PASTURE. NO SUBPLOTS ARE ESTABLISHED.



K. Identifying boundaries between condition classes

Recognize condition classes by ground land class differences regardless of whether the land classes are delineated by distinct boundaries or phase from one class to the next along an indistinct boundary. Divide the area within a forest land condition class into two condition classes that differ by stand condition and owner class condition only if the two prospective stand condition classes meet along a distinct boundary.

1. Distinct boundaries

Separate condition classes are recognized and mapped within a subplot's 16.95-meter fixed-radius plot when delineated by a distinct boundary. Distinct boundaries are delineated by an abrupt change from one condition to the next; "abrupt" means less than 3 meters of transition zone is generally present between the points at which two conditions become clearly different.

Distinct boundaries often clearly coincide with fence lines or with the edge of roads, fire lines, yards, hedges, farm fields or clearcut harvest areas, and these lines should be mapped as boundaries. Often, however, two forest stand conditions meet abruptly, yet are not demarcated by an obvious "line". In such cases, decide which condition has the taller tree overstory and determine a line connecting the outermost points on drip edge of margin overstory trees in this "taller" condition as the basis for establishing the boundary. These outermost points face the adjacent shorter condition. This "drip-edge-point- to-point" guideline is not an iron-clad rule. For instance, if trees in the margin of the shorter stand are free-to-grow (i.e., not closely overtopped by the taller, adjacent overstory), it may be more logical to map the boundary along a line connecting the facing, outermost points of margin overstory tree boles in the taller stand condition.

Five examples follow:

- a) Forest land with a well-stocked stand of sawtimber-sized conifers borders a wheat field that is fenced, and some crowns of the conifers extend beyond the fence over the wheat. Two condition classes are recognized and mapped if each prospective condition is one acre or larger and 35 meters or more in width. The mapped boundary is the fence.
- b) Timberland with a stand of 12-year conifer seedlings and saplings borders timberland clearcut 4 years ago that is now stocked with seedlings recently planted. Some of the latter seedlings on the stand margin are overtopped by their larger neighbors in the adjacent, taller stand. Two condition classes are recognized and mapped if each prospective condition is 2.5 hectares or larger and 35 meters or more in width. If no other clear demarcation is evident, the mapped boundary is probably best defined by a line connecting the outermost points on drip edges of margin overstory trees in the taller stand.
- c) Timberland with a stand of 80-year old conifer sawtimber borders timberland clearcut 4 years ago that is now stocked with seedlings recently planted. Few, if any, of the latter seedlings on the stand margin are overtopped in any suppressive way by the adjacent large trees that generally have no live crown within 20 meters of the ground. Two condition classes are recognized and mapped if each prospective condition is 2.5 hectares or larger and 35 meters or more in width. If no other clear demarcation is evident, the mapped boundary is probably best defined by a line connecting the facing outermost points of margin overstory tree boles in the taller stand condition.
- d) Subplot 1 is timberland well-stocked with 12-year old seedlings and saplings, and this situation gradually phases into what is clearly an understocked small sawtimber stand at subplot 4, and subplot 2 sits smack dab in the middle of the transition zone: treat the three subplots as being in only one condition class if the whole area is entirely timberland.
- e) A large homogeneous stand of small-sawtimber size lodgepole pine has a fence line passing through it. Signs on the fence clearly identify the land on one side as belonging to an other private - available owner and land on the other side as owned by a forest industry with mill. If the area on each side of the fence is 0.4 hectares, they are mapped as separate conditions.

2. Indistinct land class boundaries

Indistinct boundaries between forest and nonforest condition classes require that a boundary be determined and two condition classes recognized. This done by estimating the line within the transition zone at which the definition for forest land obviously no longer applies.

L. Rules for determining condition classes that differ by land class:

1. Cultural nonforest stringers

Cultural nonforest stringers (constructed roads, railroads, power lines, pipelines, and canals) 0.4 hectares or larger are called nonforest however there is no minimum width required. (Note: **At Oc3 there was a minimum width of 5 meters for cultural nonforest stringers.** Constructed roads are made for car or truck travel. They are used "to get somewhere" and not to skid logs. They are made using machines other than cars or trucks. A fork of a constructed road is nonforest if the constructed road meets the minimum area of 0.4 hectares to be recognized. Cutbanks along constructed roads are classified as nonforest regardless of the vegetation they support. "Cutbanks" include area that is engineered "cut", part of the road design, where the original topography has been disturbed and modified as a result of road building. Fills along constructed roads that have been created by dumping fill around large timber will be considered forest until the larger timber is cut.

If a cultural nonforest stringer passing through forest land is blocked by vegetation that prevents the intended use of the stringer and if the vegetation blockage is 35 meters or more long, then the stringer area on either side of the blockage must be 0.4 hectares or larger to be called nonforest land. (The intended use of a constructed road, for example, is vehicle travel). Constructed road segments that can still be driven even though trees are growing in the roadway are not blocked and are nonforest road if the driveable segment is 0.4 hectares or larger.

Segments of constructed road blocked by fallen trees, dirt berms, slides, washouts, or miscellaneous rocks and debris are still constructed road; include the berm, slide, washed out, or debris-strewn segments as road. Include brushed out, cut, or sprayed areas along or in the right-of-ways as part of a cultural nonforest stringer if these areas appear different from adjacent forest land. Note that a 5-meter wide road needs to be 800 meters long to be 0.4 hectares in area and a 10 meter wide road needs to be 400 meters long to be 0.4 hectares in area.

2. Streams

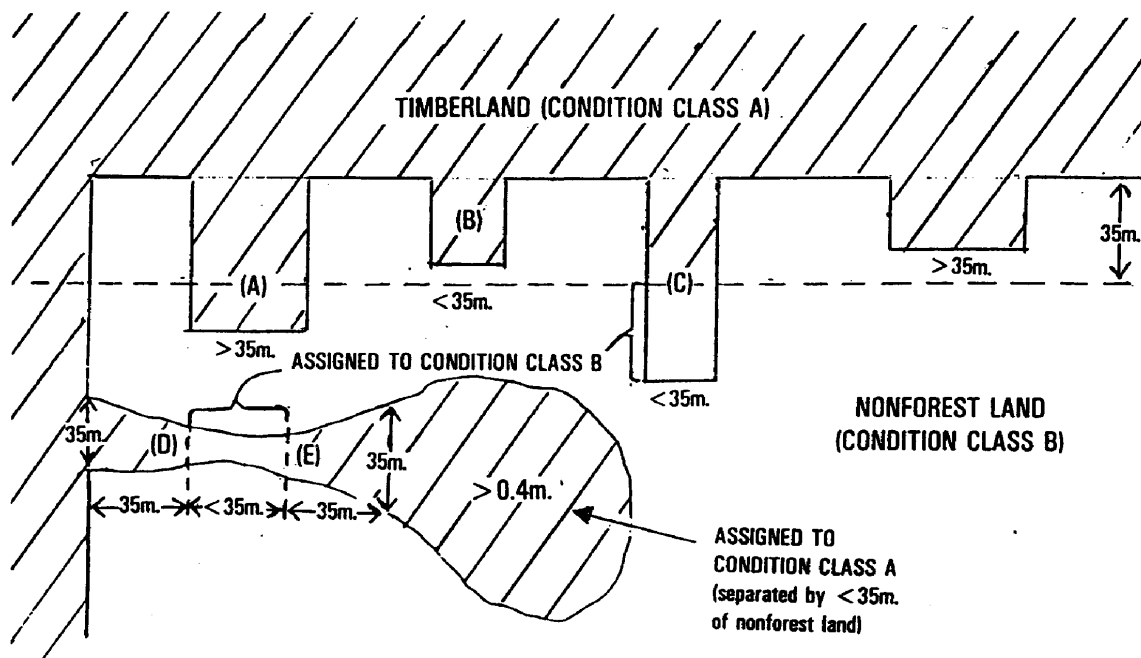
Streams 10 meters or wider and 0.4 hectares or larger are called nonforest (GLC 92). 10-meter wide streams must be at least 400 meters long to be 0.4 hectares. A fork which is 10 meters wide is nonforest if the main stream meets the above minimum area and width to be recognized as nonforest. When measuring stream width, include all area where the action of water prevents growth of trees to merchantable size. Classify stream margins, sand bars, and islands as nonforest if high water prevents trees from growing to a height of 4 meters.

3. Maintained structures

Maintained structures are always nonforest even when the structure and its surrounding nonforest area are less than 0.4 hectares. Isolated pump houses, sheds, and other structures in forested areas are not considered "maintained structures" if the primary use of the subplot area is forest.

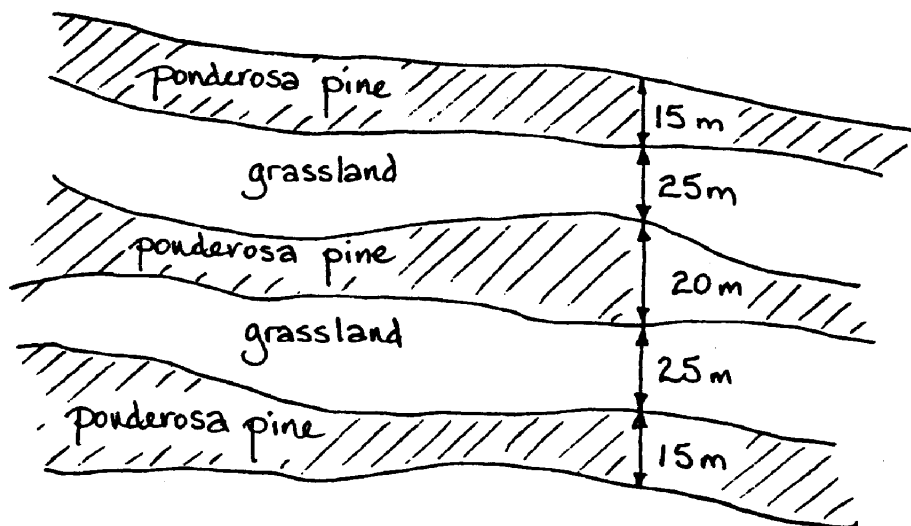
4. Stringers and Necks

Boundaries between condition classes that differ by land class often are not straight but consist of stringers and necks (see examples below). A stringer is ≥ 35 meters long; a neck is < 35 meters in length. Necks are always assigned to the condition class (land class) to which they are attached (B). Stringers ≥ 35 m. wide are assigned entirely to the condition class (land class) to which they are attached (A). If a stringer is < 35 m. wide, 35 meters of its length is assigned to the condition class (land class) to which they are attached, and the remaining "tip" is assigned to the surrounding land class (C, D, E)--see diagram on following page.



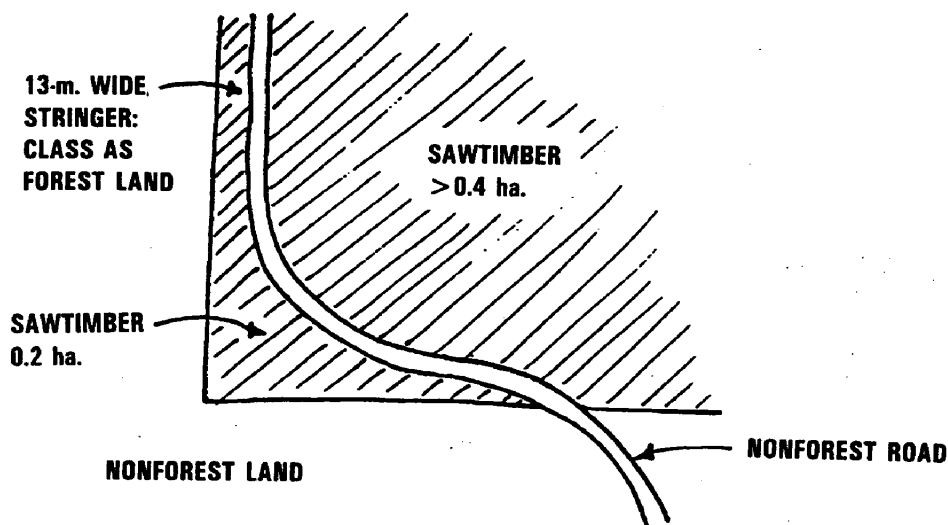
5. Intermingled forest and other natural vegetation

When forest land strips are intermingled with other natural strips, each less than 35 meter wide, classify as forest land and show the "other natural strips" as nonforest inclusions where they cross the 16.95-meter fixed-radius subplot (see page 47).



6. Forest land amputated by a cultural nonforest stringer

When a forest strip which is less than 35 meters wide is isolated from adjoining forest by a cultural nonforest stringer which is also less than 35 meters wide, classify the strip as forest if the adjoining forest is at least 35 meters wide and 0.4 hectare in size. In the example below, if the cultural nonforest stringer were greater than or equal to 35 meters, the isolated strip would be classified as nonforest--see diagram on following page.

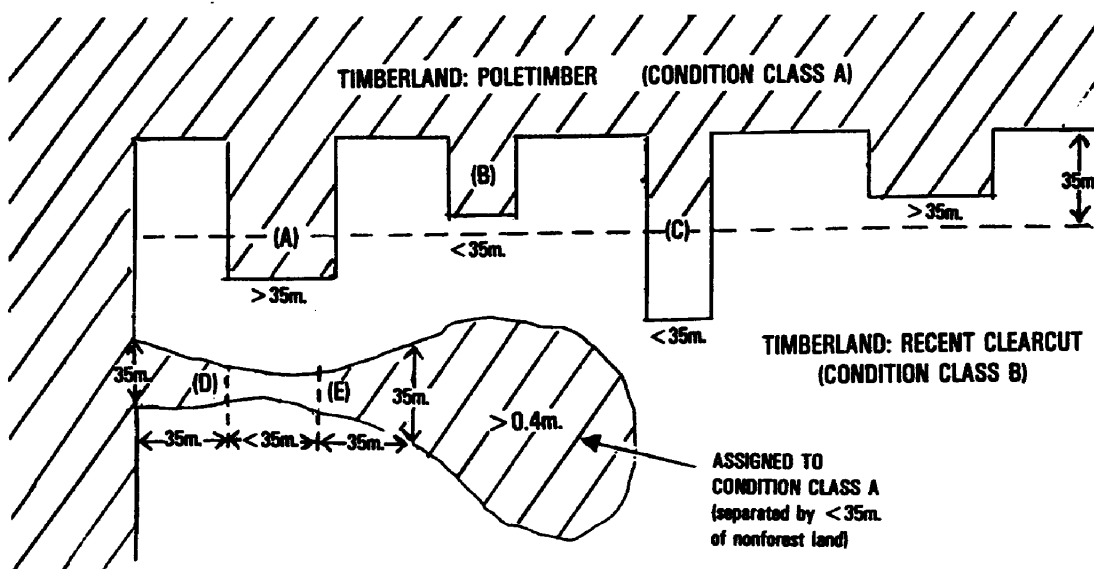


Forest vegetation includes trees, shrubs, and forbs of forest ecosystems. Areas with forest vegetation may still be called nonforest if used for nonforest purposes--for example: ferns in pastures or trees in golf courses. Separate condition classes are often delineated by a distinct change from forest vegetation to vegetation associated with nonforest use.

M. Rules for determining forest condition classes that differ by stand condition

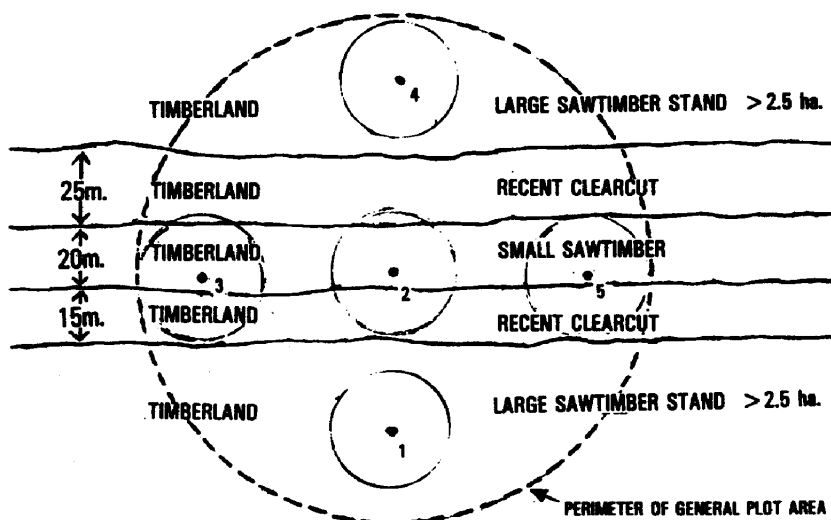
1. Stringers and Necks

Boundaries between different stand condition classes often are not straight but consist of stringers and necks (see examples below). A stringer is ≥ 35 meters long; a neck is < 35 meters in length. Necks are always assigned to the condition class (land class) to which they are attached (B). Stringers ≥ 35 m. wide are assigned entirely to the condition class (land class) to which they are attached (A). If a stringer is < 35 m. wide, 35 meters of its length is assigned to the condition class (land class) to which they are attached, and the remaining "tip" is assigned to the surrounding land class (C, D, E)--see diagram on following page.



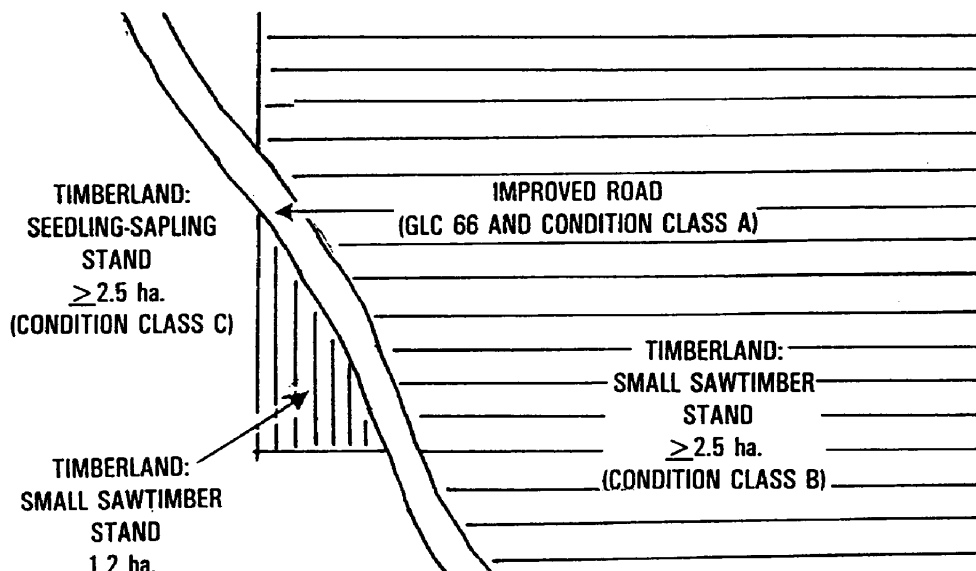
2. Intermingled stand conditions

When forest stand conditions are intermingled, each less than 35 meter wide, recognize them as only one stand condition; but base condition class attributes (forest type, stand size, stand age etc) on the individual intermingled stand condition which occupies the most plot area. If tied, base the attribute classifications on intermingled stand condition with the tallest overstory tree layer. Don't average attribute classifications; for example, if the intermingled strips are alternating seedling-sapling stands and small sawtimber stands, don't classify them as a poletimber stand but as either a seedling-sapling stand or as a small sawtimber stand. In the example below, the stand-size would be large sawtimber.

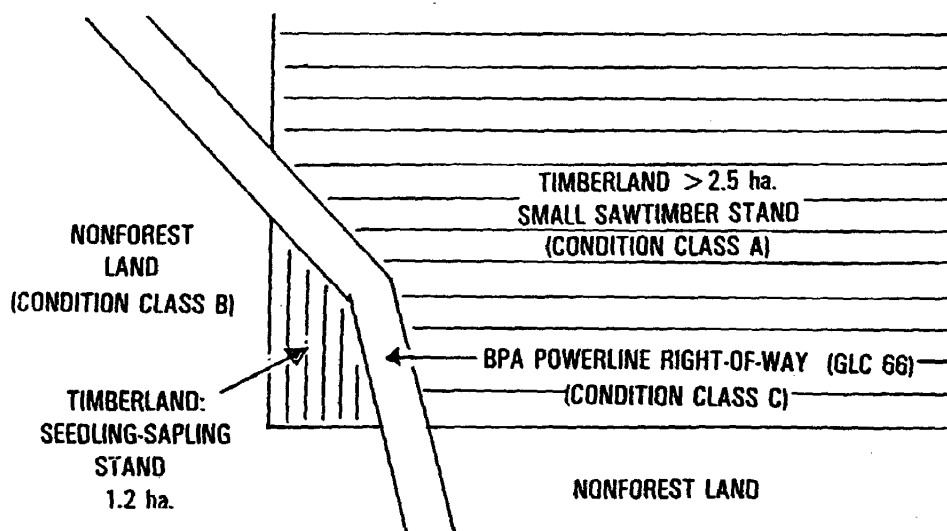


3. Forest land amputated by a cultural nonforest stringer

When a forest stand condition less than 35 meters wide is isolated from a forest stand condition of the same ground land class by a cultural nonforest stringer also less than 35 meters wide, treat both forest areas as one stand condition class if they would be recognized only as one stand condition class were the cultural stringer absent and the two forest areas bordered one another. In the example below, the 1.2 ha. area of small sawtimber would be part of the small sawtimber stand across the road (condition class B) if the road were <35 meters wide. If the road were ≥ 35 meters wide, the 1.2 ha. area would be part of the adjacent seedling-sapling stand (condition class C).



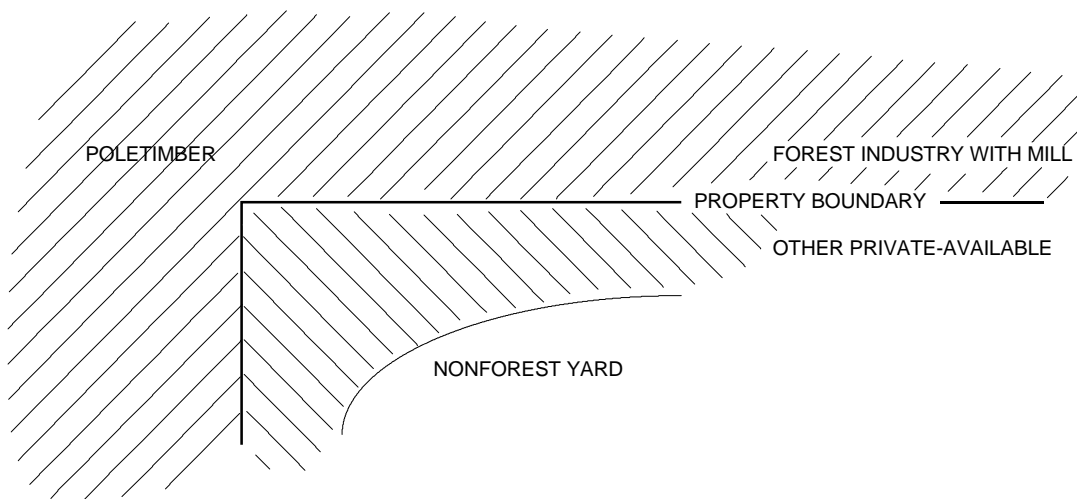
In the example below, the 1.2 ha. area of seedling-saplings would be lumped as part of the small sawtimber stand (condition class A) if the power line right-of-way were <35 meters wide. If the right-of-way were ≥ 35 meters wide, the seedling-sapling stand would be a separate forest condition class (which would not qualify for supplemental stocking plots).



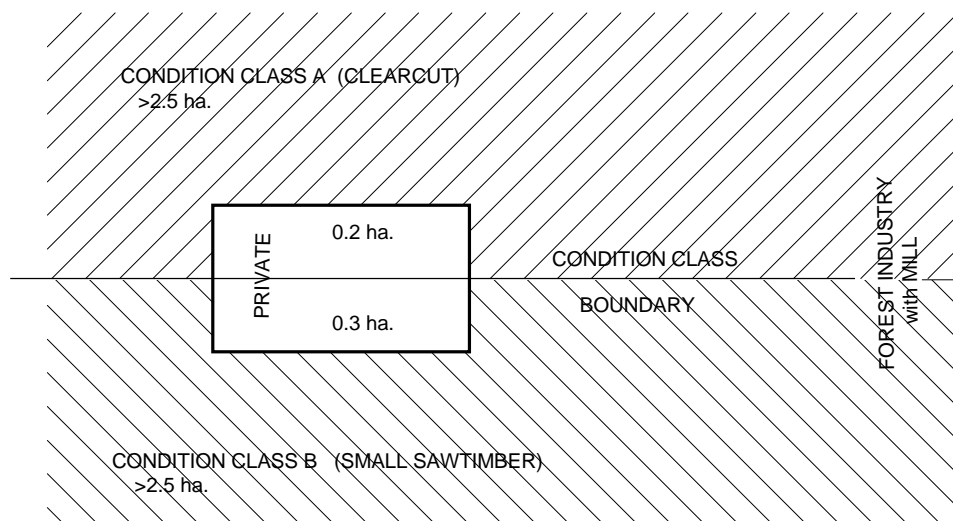
N. Rules for determining forest condition classes that differ by owner class condition

1. Subdivide only condition classes previously defined by GLC and stand condition classes

In the example below the large sawtimber was combined with the poletimber using the stand condition class determination rules (because the large sawtimber was < 2.5 ha.). If the large sawtimber is ≥ 0.4 ha. it becomes a separate owner class condition.

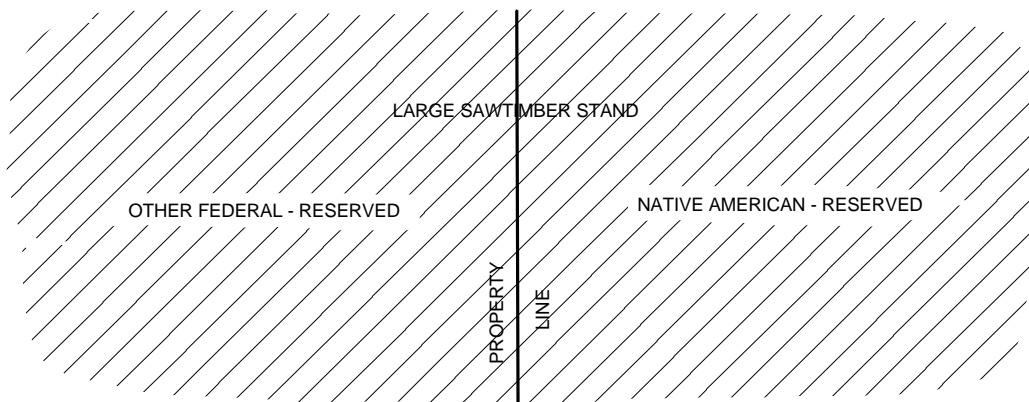


In the example below two condition classes were defined using the stand condition class determination rules. Within each condition class, no ownership class condition is ≥ 0.4 ha. No additional condition classes are defined.



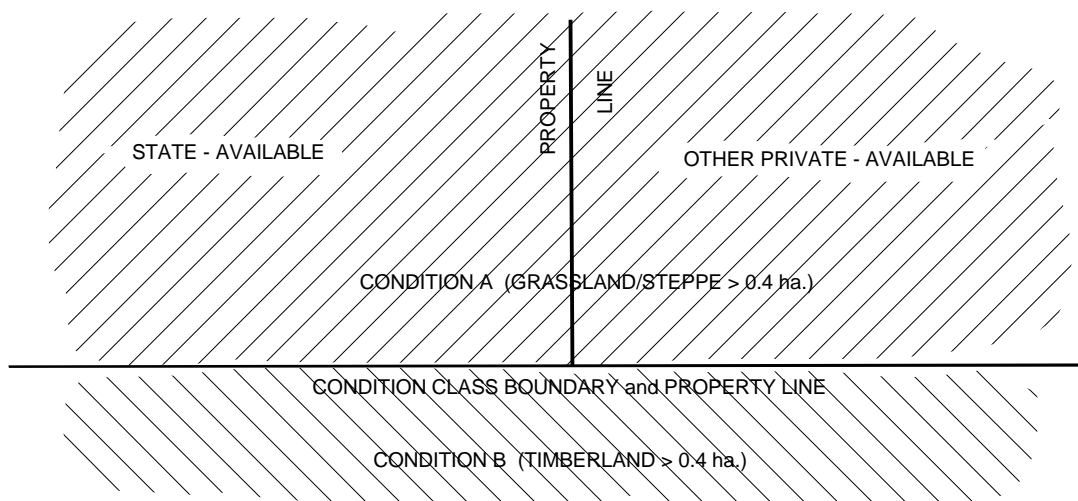
2. Subdivide conditions when a property boundary between two different owner class categories is present

A condition which has owners from within the same ownership class category is not separated. In the example below both owners in the condition class are in the reserved category, no additional owner class condition is defined.



3. Subdivide only forested conditions

The nonforest condition in the example below is not subdivided by ownership class.



4. Subdivide ownership class conditions only when a distinct boundary is visible on the ground

In the example below signs identify one area of the condition class as belonging to an owner in a different ownership category, but because the property line is not clearly delineated, the area does not qualify as a different condition.



OTHER PRIVATE - AVAILABLE

O. Referencing the plot

1. Referencing a plot visited previously

Find the location of the plot pinpricked on field photos at last visit. This previously pinpricked location is the field grid location for the plot. It was monumented at last visit with a cedar stake in the ground. The cedar stake was referenced at last visit by a RP and by two nearby reference trees. Both the RP and reference trees were marked distinctively with square and round tags using the same protocol for tagging described for Oc4 RP and Oc4 reference trees on pages 40 and 41. If a previously established plot can not found, refer to "Referencing a lost plot" on this page.

The species of the old RP, its d.b.h. to the nearest centimeter, the azimuth from RP to cedar stake, and the slope distance in meters from RP to the cedar stake were recorded on the plot card of last visit. Similar data were recorded for the nearby trees referencing the cedar stake except that azimuth was recorded from the cedar stake to the tree and distance was recorded to the nearest centimeter. Apply these data in relocating the (pinpricked) location of the old cedar stake.

On some plots, Oc3 RP referenced a subplot center other than the pinpricked location; on these plots, the cedar stake was still installed at the pinpricked location. Also, on plots where subplot 1 was moved at Oc3 to stay entirely in one condition class, the pinpricked field grid location, monumented by the cedar stake, and Oc3 subplot 1 center are not at the same place on the ground.

Once the location of the field grid location (old cedar stake) is known, do the following steps:

- Install a new cedar stake at the field grid location. Check to see that "An exception" on page 40 does not apply.
- Reference the stake to nearby two trees; see "Referencing the cedar stake" on page 41.
- Reference the new stake to an RP; see "The reference point (RP)" on page 40.
- Determine and pinprick the location of the field grid location on the Oc4 photos using Photointerpretation. Circle the pinprick in pencil on the back of the photo and write "PC" (plot center) and the plot number near the circle.
- Determine and pinprick the ground location of the RP on the Oc4 photos using photointerpretation. Circle the pinprick in pencil on the back of the photo and write "RP" near the circle.

Referencing a lost plot

A plot which was establishing previously in the field but can not be found is a lost plot. If a plot is lost, treat it like a plot not visited previously. The location to find on the ground is the plot's grid location pinpricked on a field photo at the last visit.

2. Referencing plots not visited previously

If the plot has not been visited previously, the field grid location was pinpricked on the Oc4 field photos prior to field visit. The pinprick is marked on the photos with a nearby red dot.

Do the following steps:

- a) Find this pinpricked field grid location on the ground. (The location will become the center of subplot 1 on the standard layout).
- b) Install a cedar stake at this location on the ground. Check to see that "An exception" on page 40 does not apply.
- c) Reference the new stake to nearby two trees; see "Referencing the cedar stake" on page 41.
- d) Reference the new stake to an RP; see "The reference point (RP)" on page 40.
- e) Circle the pinprick in pencil on the back of the photo and write "PC" (plot center) and the plot number near the circle.
- f) Determine and pinprick the ground location of the RP on the Oc4 photos using photointerpretation. Circle the pinprick in pencil on the back of the photo and write "RP" near the circle.

3. An exception

The cedar stake is not placed at the field grid location if the 16.95-meter fixed-radius plot at subplot 1 on the standard layout is entirely nonforest land and either of the following situations occur:

- a) the center of subplot 1 is too hazardous to visit (examples: subplot center 1 is in the middle of a pond, or the middle of a freeway, or on the side of a cliff) **OR**
- b) placing the cedar stake at the center of subplot 1 is very apt to irritate a landowner (example: subplot center 1 is in the middle of someone's front lawn).

If the exception applies, reference the center of the lowest-numbered subplot on the standard layout that has a forest land condition class present within its 16.95-meter fixed-radius plot.

Specifically, do the following steps:

- a) place a cedar stake at the center of this subplot,
- b) Reference the new stake to nearby two trees; see "Referencing the cedar stake" on page 41.
- c) Reference the new stake to an RP; see "The reference point (RP)" on this page.
- d) If a revisited plot, determine and pinprick the location of the field grid location on the Oc4 photos using photointerpretation. All plots: circle the pinprick in pencil on the back of the photo and write "PC" (plot center) and the plot number near the circle.
- e) Determine and pinprick the ground location of the RP on the Oc4 photos using photointerpretation. Circle the pinprick in pencil on the back of the photo and write "RP to subplot (insert number)" near the circle (Example: "RP to subplot 3").

Keep in mind that the field grid location in this case, is not at the location of the cedar stake. The field grid location is always the center of subplot 1 on the standard layout regardless of whether it is referenced.

4. The reference point (RP)

The RP references the cedar stake. It is an object (usually a tree) that is prominent, apt to be present at next visit and easily located on the ground.

Selecting an RP: The RP should be distinctive on both the ground and on the Oc4 photos. You may reuse the Oc3 RP tree if it is suitable. If the old RP tree is dead, missing, or difficult to identify on the ground or on the plot photo, select a new RP. If possible, it should be a tree which is not likely to die or be cut before the next inventory. You may select a snag or other object for an RP (i.e., a distinctive fence post, building corner, telephone pole, etc.). If you use such a RP, describe it on the plot photo and in "Location Description" on the Plot Record.

Tag the RP: Mark the RP tree with new or reused tags. Nail aluminum square tags on two or more sides of the RP tree, 2 meters above ground line, facing directions you expect future crews to approach the RP. Also nail an aluminum square tag on the RP tree below stump height, on the side of the tree facing the cedar stake. When attaching a tag, drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 5 centimeters of nail exposed.

Pinprick the RP location: Pinprick the ground location of the RP on the Oc4 photos UNLESS the RP pinprick would obscure another pinprick. Circle the RP pinprick on the back of the photo and write "RP" and the plot number near the circle (but do not obscure any pinpricks).

Record RP data: Record the species of the RP, it's d.b.h. to the nearest centimeter, azimuth from RP to cedar stake, and slope distance measured to the nearest meter from RP to the cedar stake under "Plot Reference" on the Plot Record.

In "Location Description" on the Plot Record, record any information that would aid the next crew in relocating the plot. Describe prominent features present in the plot area that are unlikely to change in the next ten years; examples include details such as slope, aspect, topographic position, recognizable physiographic features (i.e. streams, rock outcrops, benches), man-made features, and unusual or large trees. If any new roads have been built in the plot area since the date of the Oc4 field photos, sketch them on the photos if it will help the next crew to find the plot.

Example: "The RP is a large Douglas-fir (over 60 meters tall) in a draw that descends northeast from mainline logging road 1000. Subplot N1 is down slope from the RP and is just down slope and next to a large rock outcrop."

5. Referencing the cedar stake

To reference the cedar stake with nearby trees, **do the following steps:**

- a) Select two trees near the cedar stake that form, as closely as possible, a right angle with the stake. If the Oc3 reference trees meet this criterion, reuse them. On a revisited plot, if you select a new reference tree, remove the square tags (if present) from the reference tree it is replacing to avoid confusing the Oc5 crew. Trees within 2 meters of the stake are preferable. If live trees are not available, use stumps or sound snags.
- b) Nail a square aluminum tag below stump height (<0.2 meters above the ground) on each reference tree on the side facing the stake. If the trees are also numbered tally trees, attach the tree number tags with the same nails. When attaching a tag, drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 5 centimeters of nail exposed.
- c) In two locations on each reference tree, nail a round disc 2 meters high facing likely approaches to the subplot.
- d) Record data about the reference trees; refer to "Recording reference tree data" on page 42.

P. Referencing the other subplots on the standard layout

One subplot on the standard layout, usually subplot 1, is referenced adequately by the cedar stake and it's nearby reference trees and RP. Other subplots on the standard layout that have forest land present somewhere on their 16.95-meter fixed-radius subplot also require referencing. (R and X subplots do not require referencing at Oc4). Do the following steps:

1. Mark subplot center.

Mark subplot center with a metal pin and round.

2. Select reference trees.

Select 2 trees near the pin that form, as closely as possible, a right angle with the pin. Trees within 2 meters of the pin are preferred. If trees are not available, use stumps or sound snags. On subplots established previously, reuse the previous reference trees, or if there are better trees available, use new reference trees. Renew old reference tags as needed.

3. Tag the reference trees.

- a) If a tally tree: Nail an aluminum round to each reference tree, 2 meters above ground line, facing the direction you expect future crews to approach the subplot. If the tree is a trackable (tally) tree that does not require a numbered tag, attach an aluminum round tag below stump height facing subplot center. When attaching a round tag, drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 5 centimeters of nail exposed.
- b) If not a tally tree: Nail an aluminum round 2 meters above ground line facing the direction you expect future crews to approach the subplot, and nail one aluminum round below stump height facing the subplot center. If the reference is a live tree with a diameter 7.5 cm. d.b.h. or larger, mark where d.b.h. is measured with an aluminum nail; rules for marking d.b.h. on page 105 apply. When attaching a round tag or marking d.b.h., drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 5 centimeters of nail exposed.

4. Record data about the reference trees

Refer to "Recording reference tree data" (next section).

Q. Recording reference tree data (all subplots on the standard layout)

Azimuth (subplot center to tree), slope distance measured to the nearest decimeter, species and diameter are recorded for each reference tree, snag, or stump.

1. If a tally tree

If a reference tree or snag is a trackable tally tree, enter a "*" after it's tree history by entering a "V" on the Husky data recorder; the Husky will then insert an asterisk after the tree history to indicate the tally tree is a reference tree. Be sure the distance is measured and recorded to the nearest centimeter.

If the reference is a standing dead tree with a tree history 3 or 5, or is the stump of a tree with a tree history 8 or is a snag with a tree history 7 that has a "reason for disappearance" code of 02 through 06, enter a new reference record for the tree or stump; assign the record a tree history of 9, and record azimuth, distance, species, and diameter (use the Oc3 d.b.h. if reasonable).

2. If not a tally tree

If a reference is not a trackable tally live tree, snag or stump, enter a new record; assign tree history of 9, and record azimuth, distance, species, and Oc4 d.b.h. If d.b.h. is 7.5 cm. or larger, measure the diameter as accurately as you would for a live tally tree. This is important because a reference tree may grow big enough to be a live tally trees at the next occasion.

IV. SUBPLOT ATTRIBUTES

TABLE OF CONTENTS

IV. SUBPLOT ATTRIBUTES	45
Required tally for the subplot attribute record	45
A. Subplot Identification	45
B. Physioclass Information	45
Aspect	45
Slope	46
Topographic position	46
C. Stream Information	47
Stream class	47
Stream proximity	47
D. Nonforest Inclusions (16.95-meter fixed-radius plots)	47
1. General instructions	47
2. Downloaded estimates of nonforest inclusion	48
E. Condition Class (16.95-meter fixed-radius subplots)	49
1. General instructions	49
2. Mapping condition classes on the subplot diagrams	49
3. Estimating and recording area percentages by condition class	50

IV. SUBPLOT ATTRIBUTES

Required tally for the subplot attribute record

If one or more forest land condition classes are present within 16.95 meters (horizontal distance) of a subplot center, one of the following alternative applies:

Subplot Number	Required Subplot Attributes by Section
##	All
C#	All
N#	All
R#	None except E (see page 7)
X#	None except E (see page 7)

If the condition classes on a subplot are all nonforest (GLC 63-92), record only the condition class number and condition class area percentage for each condition class mapped within the subplot's 16.95-meter fixed-radius plot.

A. Subplot Identification

1. **Subplot number:** Record a 2-character code for each subplot on the standard layout (the 5-point plot diagrammed on page 19) that is assessed at Oc4 (See pages 20-24).
2. **Condition class at subplot center:** Record a 1-digit code that indicates the condition class present at the center of each subplot on the standard layout.

B. Physioclass Information

Aspect, slope, and topographic position are recorded by subplot as well as by (forest) condition class. Code these items for each subplot on the standard layout. Do so only if one or more condition classes are forest (GLC 20-50) within a subplot's 16.95-meter fixed-radius plot, i.e., if all condition classes present on a subplot are nonforest land, leave aspect, slope, and topographic position blank. Physioclass data by subplot aids in determining these variables by forest condition class.

Aspect and slope were recorded by subplot on forest plots visited at Oc3. These Oc3 data are printed/downloaded. If an Oc3 subplot is on the Oc4 standard layout, and one or more forest condition classes (GLC 20-50) are within the subplot's 16.95-meter fixed-radius plot, update Oc3 aspect and slope, and add a code for topographic position.

The downloaded Oc3 data may be from a subplot that was moved or substituted at Oc3. In the current inventory, a subplot of this kind is replaced with a new (N or C) subplot on the standard layout. For the new subplot, replace the downloaded Oc3 data with valid estimates for the new subplot. If the new subplot is entirely of nonforest condition classes, delete the Oc3 data and leave aspect, slope, and topographic position blank.

Aspect

Record a 3-digit azimuth indicating the direction of slope for the land surface of the subplot. Code only if one or more condition classes within the subplot's 16.95-meter fixed-radius plot are forest land (GLC 20-50). Use "360" for north aspect. If aspect is flat, record as "000" and record slope as "00". When the Oc3 aspect data is downloaded/printed it requires updating, replace the 2-character code used at Oc3 with an Oc4 3-digit numerical code. These codes are also used to assign aspect by condition class (see page 62).

If aspect changes gradually across the subplot (or condition class), record an average aspect. If aspect changes across the subplot (or condition class) but the aspect is predominately of one direction, code the predominate direction rather than the average. See the instructions following the topographic position codes if the subplot (or condition class) falls on or straddles a canyon bottom or narrow ridge top.

Slope

Record a 2-digit code indicating the percent slope of each subplot. Record the exact slope or round to nearest 5 percent. Code only if one or more condition classes within the subplot's 16.95-meter fixed-radius plot are forest land (GLC 20-50). If there is no slope, record as "00" and record aspect as "000". Slopes ≥ 99 percent are recorded as "99". These codes are also used to assign slope by condition class (see page 62).

If slope changes gradually across the subplot (or condition class), record an average slope percent. If slope changes across the subplot (or condition class) but the slope is predominately of one percentage, code the predominate slope percentage rather than the average slope percentage. See the instructions following the topographic position codes if the subplot (or condition class) falls on or straddles a canyon bottom or narrow ridge top.

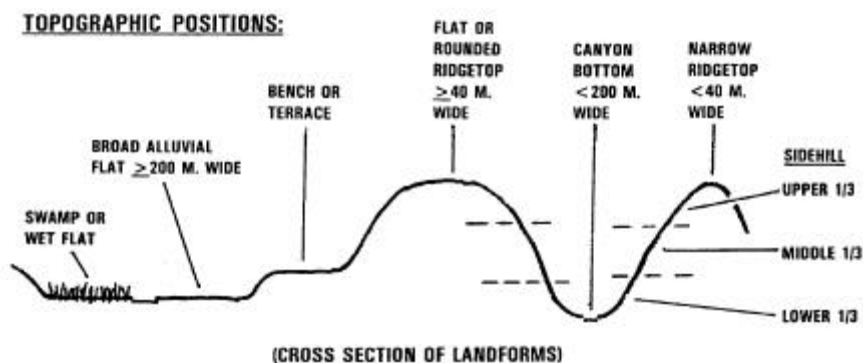
Topographic position

Record a 1-digit code for topographic position for each subplot. Code only if one or more condition classes within the subplot's 16.95 meter fixed-radius plot are forest land (GLC 20-50). These codes are also used to assign topographic position by condition class (see page 62).

Code	Shape of Slope	Topographic Position
1	Flat	Ridge top or mountain peak over 40 meters
2	Convex	Narrow ridge top or peak less than 40 meters wide.
3	Convex	Side hill -- upper 1/3
4	No rounding	Side hill -- middle 1/3
5	Concave	Side hill -- lower 1/3
6	Concave	Canyon bottom less than 200 meters wide
7	Flat	Bench, terrace or dry flat
8	Flat	Broad alluvial flat over 200 meters wide
9	Flat	Swamp or wet flat

If a subplot (or condition class) straddles a canyon bottom or narrow ridge top, code aspect, slope, and topographic position as follows:

- Code the aspect of the ridge line or canyon bottom.
- Code the average slope of the side hill(s).
- Code topographic position as a narrow ridge top or canyon bottom.
- If subplot (or condition class) falls on a canyon bottom or on a narrow ridge top, but most of the area lies on one side hill, code the aspect, slope, and topographic position of the side hill.



C. Stream Information

Information on streams is used to analyze forest land adjacent to streams. Code stream class and stream proximity for each subplot on the standard layout. Do so on a subplot only if one or more forest land condition classes (GLC 20-50) are present within the subplot's 16.95-meter fixed-radius plot, i.e. if all condition classes present on the subplot are nonforest land (GLC 63-92), leave stream class and stream proximity blank.

Stream class

Record a 1-digit code describing the stream class of the area within 65 meters (horizontal distance) of the subplot center.

Code	Description	Definition
0	No streams or lakes	No stream or lake is within 65 meters horizontal distance of subplot center.
1	Perennial streams	Streams that flow throughout most of the year (except for infrequent and extended periods of drought); include lakes in this category.
2	Intermittent streams	Streams or part of stream that flows only part time because it receives water from seasonal sources such as springs and bank storage as well as precipitation. This does not include ephemeral streams, which flow only briefly in direct response to precipitation.

Stream proximity

Record a 2-digit code indicating the horizontal distance in meters from the stream edge to the subplot center. If there is no stream within 65 meters horizontal distance of subplot center, record "00". Valid codes are 00 through 65.

D. Nonforest Inclusions (16.95-meter fixed-radius plots)

Nonforest inclusions are areas that are nonforest but are too small by definition to qualify as a separate nonforest condition class. These inclusions are inherently incapable of supporting tree stocking at 10 percent or more of normal full stocking for the life of a stand. Examples of nonforest inclusions can be unimproved dirt lanes, small streams, and sites with standing or running water, a high water table, a rock outcropping occupying at least 20 square meters, severe soil compaction (i.e. an old landing), or mass soil movement (slips, slides, or slumps). A stream or improved road which qualifies as nonforest land should be recognized as a separate nonforest condition class and not as a nonforest inclusion.

1. General instructions

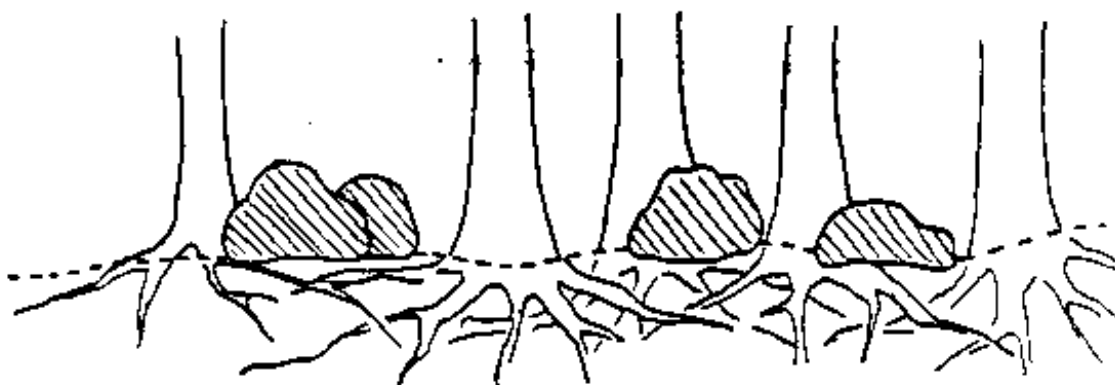
Nonforest inclusions are mapped and recorded by subplot on the standard layout. This is done only if the nonforest inclusion is present within a mapped forest land condition class (GLC 20-50) and is partially or entirely within the subplot's 16.95-meter fixed-radius plot. If all condition classes present on a subplot are nonforest land, nonforest inclusion records are set or left blank for the subplot.

Map and label nonforest inclusions lying within the 16.95-meter fixed-radius plot on the subplot diagram. For each forest condition class mapped on the subplot, estimate the percentage of the 16.95-meter fixed-radius plot area occupied by the mapped nonforest inclusions; see page 8 for how to map and estimate percentages. Record these percentages, their assigned forest condition class numbers and the type(s) of inclusion under "Inclusions %" on the subplot diagram. Then, record, by forest condition class, these percentages and their assigned condition class numbers under "Nonforest inclusions" within SUBPLOT ATTRIBUTES. Record "00" in the "%" column for each forest condition class without nonforest inclusions, or set condition class and % to blank.

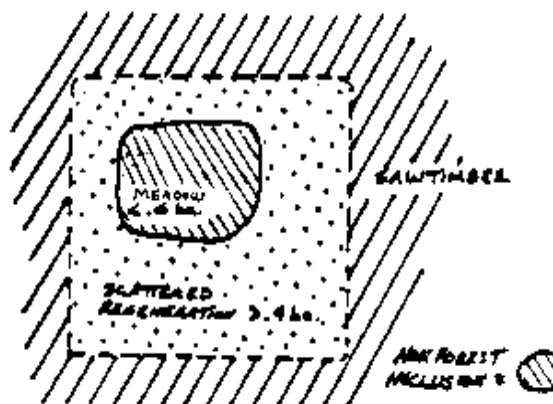
2. Downloaded estimates of nonforest inclusion

Nonforest inclusions were mapped and recorded by subplot on timberland plots visited at Oc3. These Oc3 data are printed/downloaded. If an Oc3 subplot is on the Oc4 standard layout and data for Oc3 nonforest inclusions are downloaded, revise the Oc3 estimate and enter the appropriate condition class number to reflect the situation at Oc4. You may need to record more than one estimate for nonforest inclusions if there is more than one forest condition class mapped on the subplot's 16.95-meter fixed-radius plot. If there are no nonforest inclusions present, set the downloaded estimate to "00".

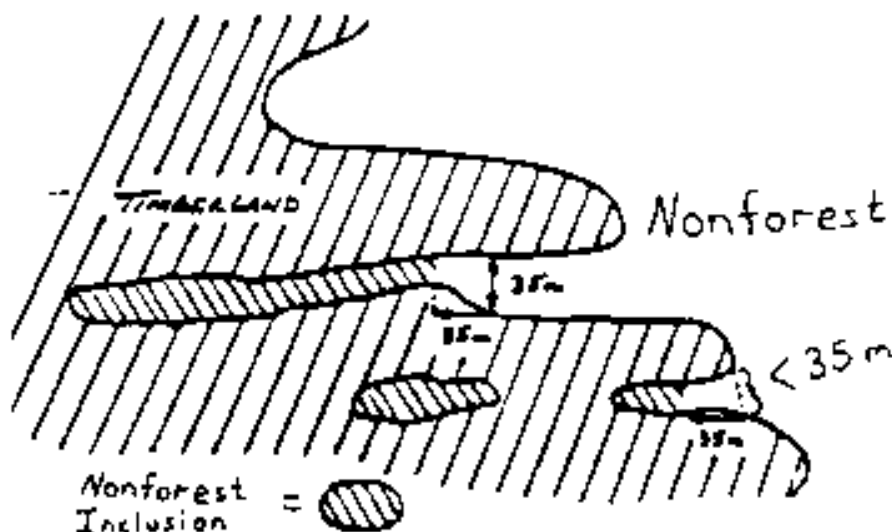
The downloaded Oc3 data may be from a subplot that was moved or substituted at Oc3. In the current inventory, a subplot of this kind is replaced with a new (N or C) subplot on the standard layout. For the new subplot, update the condition class number to reflect the situation at Oc4, and replace the downloaded Oc3 data with valid estimate(s) for the new subplot. If there are no nonforest inclusions present, set the downloaded estimate to "00".



Example: Large, scattered boulders cover 25 percent of the 16.95-meter fixed-radius subplot. However, tree roots can fully utilize the space beneath the boulders. The boulders thus have no effect on potential tree stocking, and the item is coded "00" and the rocks are not mapped on the 16.95-meter fixed-radius subplot diagram as nonforest inclusions.



Example: A swampy meadow less than 0.4 hectare in area is surrounded by forest land that is greater than 0.4 hectare. The meadow is a nonforest inclusion, and the portion of the meadow within the 16.95-meter fixed-radius plot is mapped as an inclusion on the subplot diagram.



Example: In the above example the nonforest stringer (see page 32) is classified as timberland because it is not 35 m wide. Therefore that part of the nonforest stringer is a nonforest inclusion and would be mapped as an inclusion. The nonforest neck is classified as nonforest because it is less than 35 meters long and connected to a nonforest area that is at least 35 meters wide and 0.4 hectare in size. Since it is a different condition class it would not be mapped as a nonforest inclusion.

E. Condition Class (16.95-meter fixed-radius subplots)

1. General instructions

For each subplot on the standard layout and for R and X subplots, determine for each condition class the area in percent of the 16.95-m fixed-radius plot that is within each class. Do this regardless of whether a condition is forest or nonforest land and regardless of whether a subplot has one or more forest land condition classes present or is entirely classified as nonforest land.

2. Mapping condition classes on the subplot diagrams

Where a subplot has more than one condition class, the condition class boundaries will be drawn on the 16.95-meter fixed-radius subplot diagram. The field crew will map the condition class boundaries so that the boundaries can be replicated by a check plotter and the Occasion 5 crew. This is done by determining and recording the perpendicular distance and azimuth from subplot center to each condition class boundary on the 16.95-meter fixed-radius subplot diagram (See example 1 on the next page). On the subplot diagram, space is provided to record two pairs of azimuths and distances. If there are two condition class boundaries, map and record azimuths and distances to both, labeling the azimuths and distances with the condition class number (See example 2 on next page). If there is only one condition class but the boundary is not straight, record two azimuths and perpendicular distances to the boundary and mark the two points on the curved boundary (See example 3 on the next page).

The subplot diagram is designed to aid mapping condition classes, nonforest inclusions and hardwood site. The concentric circles on the diagram represent 2.41/2.96-meter, 5-meter, 10-meter, 15-meter, and 16.95-meter distances from the subplot center. The interval between dark dots represents 2 meters, and the interval between light dots represents 1 meter.

3. Estimating and recording area percentages by condition class

Where a subplot has only one condition class record "99" on the appropriate condition class line on the Subplot Attribute Record and record "00" in the remaining condition classes. If a subplot has more than one condition class, record the percent of the subplot in each condition class. It is unlikely that a subplot will have more than two condition classes, but if it does, make sure that "% in condition class" is recorded on the correct condition class line and that the percentages sum to 100 percent for each subplot center.

The area percentages for subplots on the standard layout, R subplots, and X subplots are recorded in the data recorder.

On subplots with more than one condition class, use the 16.95-meter fixed-radius subplot diagram to estimate percent of the subplot in each condition class in the following way:

1. Each dark dot represents 0.22 percent of the area within the 16.95-meter subplot. (Within the 2.41/2.96-meter circle on a diagram, each dark dot represents 11.1 percent of the area within this circle).
2. Draw the condition class boundary and count the number of dark dots within the boundary. Count every other dark dot of those which fall directly on a boundary.
3. Multiply the number of dark dots from (b) by 0.22 to get percent of the subplot in that condition class. Alternatively, count the number of dark dots from (b); divide by 454 (total number of dark dots in a circle) and multiply by 100 to get the percent of the subplot in that condition class. (See the legend on the diagram plot card.)
4. These steps are also used to estimate, by condition class, the percentage of subplot area mapped as nonforest inclusion.

OREGON		EXAMPLE 1		EXAMPLE 2		EXAMPLE 3	
CONDITION CLASS MAP		CONDITION CLASS MAP		CONDITION CLASS MAP		CONDITION CLASS MAP	
NONFOREST INCLUSION MAP		NONFOREST INCLUSION MAP		NONFOREST INCLUSION MAP		NONFOREST INCLUSION MAP	
ROOT ROT MAP		ROOT ROT MAP		ROOT ROT MAP		ROOT ROT MAP	
COUNTY	PLOT	COUNTY	PLOT	COUNTY	PLOT	COUNTY	PLOT
DISEASE CODES		DISEASE CODES		DISEASE CODES		DISEASE CODES	
PN = PHELLINUS (LAMINATED) CW = BLACK STAIN (DO NOT MAP) AM = ARMILLARIA FA = FOMES ANNOSUS UK = UNKNOWN NO = NONE PRESENT		CC2 Az 360° Dist 12m		CC2 Az 360° Dist 12m		CC2 Az 360° Dist 12m	
17 M CIRCLE Calculate: % of plot Area = # of counted dark dots 1 dark dot = 0.22% of circle 100% (1) = 454 dark dots 50% (1/2) = 227 dark dots 25% (1/4) = 114 dark dots 12.5% (1/8) = 57 dark dots Light dot interval = 1 meter, dark dot = 2 meters Concentric Circles = 5, 10, 15, 17 Meters		17 M CIRCLE Calculate: % of plot Area = # of counted dark dots 1 dark dot = 0.22% of circle 100% (1) = 454 dark dots 50% (1/2) = 227 dark dots 25% (1/4) = 114 dark dots 12.5% (1/8) = 57 dark dots Light dot interval = 1 meter, dark dot = 2 meters Concentric Circles = 5, 10, 15, 17 Meters		17 M CIRCLE Calculate: % of plot Area = # of counted dark dots 1 dark dot = 0.22% of circle 100% (1) = 454 dark dots 50% (1/2) = 227 dark dots 25% (1/4) = 114 dark dots 12.5% (1/8) = 57 dark dots Light dot interval = 1 meter, dark dot = 2 meters Concentric Circles = 5, 10, 15, 17 Meters		17 M CIRCLE Calculate: % of plot Area = # of counted dark dots 1 dark dot = 0.22% of circle 100% (1) = 454 dark dots 50% (1/2) = 227 dark dots 25% (1/4) = 114 dark dots 12.5% (1/8) = 57 dark dots Light dot interval = 1 meter, dark dot = 2 meters Concentric Circles = 5, 10, 15, 17 Meters	
Condition Class Boundary Az 360° Dist 12m		Condition Class Boundary Az 360° Dist 12m		Condition Class Boundary Az 360° Dist 12m		Condition Class Boundary Az 360° Dist 12m	
Subplot # _____ Disease % _____ Non Forest Inclusion % _____		Subplot # _____ Disease % _____ Non Forest Inclusion % _____		Subplot # _____ Disease % _____ Non Forest Inclusion % _____		Subplot # _____ Disease % _____ Non Forest Inclusion % _____	

V. CONDITION CLASS ATTRIBUTES

TABLE OF CONTENTS

V. CONDITION CLASS ATTRIBUTES.....	55
Required tally for the plot attribute record.....	55
Field Data Recorder Entries by Item Number	55
Item 1--County.....	55
Item 2--Plot number.....	55
Item 3--Zone.....	56
Item 4--Sample kind	56
Item 5--Oc4 owner class.....	57
Ownership class definitions	58
Item 6--Date of Oc4 inventory.....	59
Item 7--Date of Oc3 inventory.....	59
Land Class Definitions	59
Item 8--Oc4 ground land class.....	59
Forest land (codes 20-50)	59
Other Forest Land (codes 41-50)	59
Nonforest land (codes 63-92).....	61
Item 9--Oc3 ground land class.....	61
Item 10--Basal Area Factor.....	62
Item 11--Precipitation	62
Item 12--Elevation	62
Item 13--Hydrologic unit code	62
Item 14--Condition class aspect.....	62
Item 15--Condition class slope.....	62
Item 16--Topographic Position	62
Item 17--Soil depth	62
Item 18--Harvest before Oc3	63
Item 19--Year of harvest before Oc3.....	63
Item 20--Disturbance before Oc3.....	63
Item 21--Harvest since Oc3	64
Item 22--Year of harvest since Oc3	65
Item 23--Year of harvest since Oc3 confirmed?	65
Item 24--Disturbance since Oc3.....	65
Item 25--Silvicultural treatment since Oc3	66
Item 26--Type of Logging.....	66
Item 27--Forest Type	67
Item 28--Stand Size.....	67
Item 29--Stand Age	67
Item 30--Plant Association	68
Item 31--Stand Condition.....	70
Item 32--Crown Closure at Oc3.....	70
Item 33--Crown Closure at Oc4.....	70
Item 34--Oc3 remeasurement period	71
Item 35--Oc3.5 remeasurement period	71
Additional instructions for Items 18 through 31	71

V. CONDITION CLASS ATTRIBUTES

This section covers attributes that require completion by condition class. County, plot number, and dates of inventories are entered only once for a plot. On revisited plots, some attributes were recorded at Oc3 and are printed/downloaded for condition class 1. Some may require updating.

Required tally for the plot attribute record

Sample Kind of the Condition Class	Oc4 GLC of the Condition Class	Items Needed
1, 3	20, 41, 43, 44, 46, 49, 50	1 - 31, 34, 35.
1, 3	45	1 - 17, 31
5,6	20, 41, 43, 44, 45, 46, 49, 50	1 - 19, 21 - 23, 32, 33
7	20, 41, 43, 44, 45, 46, 49, 50	1 - 8. Condition class \geq 2
9	63 - 92	1 - 13
0	Out of inventory	1 - 6

This listing applies only to condition classes mapped on 5-subplot standard layouts, and to plots that consist of one 16.95-meter fixed-radius vegetation subplot (sample kind 3).

Field Data Recorder Entries by Item Number

Item 1--County

A 3-digit code that is printed/downloaded. Do not change this code in the field. The code identifies the county in which the plot and its condition class lie. Listed below by county name are county codes, magnetic declinations, and survey units: (C) Central Oregon, and (B) Blue Mountains Oregon.

Code	County	Declination Degrees East	Unit
001	Baker	19-1/2	B
013	Crook	19-1/2	C
017	Deschutes	20	C
021	Gilliam	20	C
023	Grant	19-1/2	B
025	Harney	19	B
031	Jefferson	20	C
035	Klamath	19	C
037	Lake	19	C
045	Malheur	18-1/2	B
049	Morrow	20	B
055	Sherman	20-1/2	C
059	Umatilla	20	B
061	Union	19-1/2	B
063	Wallowa	19-1/2	B
065	Wasco	20-1/2	C
069	Wheeler	20	C

Item 2--Plot number

A 3-digit code that is printed/downloaded. Do not change this code in the field.

Item 3--Zone

A 1-character code printed/downloaded into condition class 1 identifying which zone the plot is in. Do not change this code in the field.

Code	Definition
T	Plot is in the Timberland zone
H	Plot is in the High-desert zone

Item 4--Sample kind

Sample kind is a 1-digit code required for all condition classes mapped on subplots on the standard layout. Sample kind indicates whether a condition class is sampled forest land, area for which access is denied, area that is not part of inventoried area, or land that is nonforest. For forest land condition classes, it also indicates the plot type (either a 5-point plot with variable-radius tree selection, a 5-point plot with another method of tree selection, or a 4-point plot with fixed-radius tree selection). See "What type of plot to install at Oc4" on page 19.

Sample kind is printed/downloaded for condition class1; update this sample kind for condition class 1 if incorrect. Use the following schedule and instructions to determine sample kind for each condition class mapped on subplots.

Only Sample Kinds 1, 3, 5, 6, 7, 9 and 0 are described in this field manual. Other codes are not valid during the 1998 season.

Code	Sample Kind	Definition
1	Sampled forest land condition class with variable-radius tree selection plots	Condition class has an Oc4 GLC of 20, 41, 43, 44, 45, 46, 49 or 50. Condition class is associated with a plot which has an Oc4 GLC of 20, 41, 46, or 49 (5-point, variable-radius plot)
3	Forest land condition class on a 16.95-meter fixed-radius vegetation profile plot at Oc4	Condition class at subplot center is too hazardous to allow taking anything but a 16.95-meter veg plot. All other subplots whose centers are in the same condition class as this subplot's center are also too hazardous. (See pages 26 and 81).
5	Access-denied forest land condition class, no harvest since Oc3	Forest land plot visited at Oc3 that <u>has not</u> been harvested since Oc3. Access is denied at Oc4. See Appendix 6 (page 186) for instructions. (5-point, variable-radius plot)
6	Access-denied forest land condition class, harvest since Oc3	Forest land plot visited at Oc3 that <u>has</u> been harvested since Oc3. Access is denied at Oc4. See Appendix 6 (page 186) for instructions. (5-point, variable-radius plot)
7	Access-denied forest land condition class, condition not visited at Oc3	Forest land condition class which was not visited at Oc3. Access is denied at Oc4. Field grid location has a GLC of 20, 41, 46, or 49 (5-point variable-radius plot)
9	Nonforest condition class	Condition class has an Oc4 GLC of 63-92. Associated w/ GLC 20, 41, 46, or 49 (5-point variable-radius-plot)
0	Out of inventory	Condition class is outside inventoried area at Oc4. Owner class is National Forest (601-650), Census Water (98), or out-of-resource-area, out-of-state (999).

Item 5--Oc4 owner class

A 3-digit code which indicates the current owner classification. Required for each condition class. Owner class is printed/downloaded for condition class 1, and indicates the owner classification collected in the county courthouse for subplot 1 center (the pinpricked field grid location). Update this code for condition class 1 if incorrect.

If the owner class is updated for condition class 1, enter "YES" in "DOES CURRENT OWNER CLASS DIFFER FROM DOWNLOADED OWNER CLASS?" on the Plot Record and note the source of information. Oc3 owner class is found on the Oc3 plot card. If the difference is due to a real change in ownership since Oc3, record the date of the ownership change, if known, in "IF YES, DATE OF CHANGE" on the Plot Record.

A change in owner does not necessarily mean that owner class changed. For example, if Tubafore Lumber Co. was the owner at Oc3 but sold the site to Big Stick Wood Products, the owner class remained forest industry. In some cases, different owner classes define separate condition classes even if all other land class and broad stand condition variables are the same. See page 37 for when to separate otherwise similar conditions because of an owner class boundary. In condition classes 2 and higher, in cases where two or more owner classes are present within one condition class, assign the code of the owner class occupying the most mapped area on the 16.95-meter fixed-radius subplots in the condition. If the amount of mapped area is equal, assign the code of the owner class occupying the most area in the entire condition class.

Differences in owner class are recognized only when the property boundaries are clearly identifiable. For lands within inventoried area, this decision is made on the ground while visiting the plot location and no further time needs to be spent. The boundaries between in-the-inventory and out-of-inventory area may require additional verification at the county courthouse or the managing agency office.

If the center of a subplot is inventoried area, but has out-of-inventory area (National Forest or census water) within the subplot's 16.95-meter fixed-radius plot, 1) map the out-of-inventory area as a separate condition class, 2) assign this class a sample kind of 0, and an "out-of-inventory" owner class code, and 3) record the segment lengths of any cwd transects that extend into the out-of-inventory class. If the out-of-inventory owner class is census water (code 98), Oc4 GLC is also set to 98.

If the center of the subplot is in out-of-inventoried area, the entire subplot is dropped from the inventory. If the subplot center is the pinpricked field grid location (subplot 1), the entire 5-subplot plot is dropped from the inventory (see page 18).

Owner classifications are used in compiling forest statistics as follows:

PUBLIC OWNERS	
National Forests:	
601	Deschutes National Forest
602	Fremont National Forest
604	Malheur National Forest
606	Mt. Hood National Forest
607	Ochoco National Forest
610	Rogue River National Forest
614	Umatilla National Forest
616	Wallowa-Whitman National Forest
620	Winema National Forest
622	Columbia River Gorge NSA
650	Crooked River National Grassland

Other Public:	
7	Other Federal – Reserved
10	Bureau of Land Management – Reserved
12	Bureau of Land Management – Available
14	Other Federal – Available
15	State – Available
16	County and Municipal – Available
18	State – Reserved
19	County and Municipal – Reserved
PRIVATE OWNERS	
Forest Industry:	
21	Forest Industry with Mills
71	Forest Industry without Mills
Nonindustrial Private:	
8	Other Private – Reserved
9	Native American – Reserved
51	Other Private – Available
800	Native American – Available
CENSUS WATER	
98	Census Water

Ownership class definitions

Available land -- Land not withdrawn from timber utilization through statute, ordinance, or administrative order.

Bureau of Land Management land -- Land administered by the BLM

County and municipal land -- Land owned by county or other local agencies.

Forest industry land --

- a) With mills: land owned by companies or individuals operating wood-using plants.
- a) Without mills: land owned by companies that grow timber for industrial uses but do not operate wood-using plants.

Other private land -- Private lands not qualifying as either forest industry land or Native American land. Includes farmer and miscellaneous private lands.

Native American land -- Tribal land held in fee by the Federal government but administered for Indian tribal groups, and Native American trust allotments.

National Forest land -- Land administered by the Forest Service. Land proclaimed to one National Forest but administered by another National Forest are assigned ownership code of the administering National Forest.

Other Federal land -- Land administered by U.S. government agencies other than the BLM and the Forest Service.

Reserved land -- Land withdrawn from timber management by statute, ordinance or administrative order. Includes National, State, County and municipal parks, BLM reserved, Native American reserved, and land owned by The Nature Conservancy.

State land -- Land owned or administered by the State of Oregon.

Census water -- Bodies of water as defined by the Bureau of the Census. Includes bodies of water ≥ 1.8 hectares in size and streams ≥ 61 meters in width. Also includes Great Lakes, coastal bays and estuaries, and territorial waters to 3 miles from the ocean shore.

Item 6--Date of Oc4 inventory

Record a 4-digit code for condition class 1. The first 2 digits indicate the month the plot is taken, and the second 2 digits indicate the year. Example: a plot is visited in July of 1998; the date of Oc4 inventory is coded "0798".

Item 7--Date of Oc3 inventory

4-digit code printed/downloaded for condition class 1 if a date was assigned for the plot at Oc3. Indicates the month and year of the Oc3 inventory using the same coding scheme as Item 6. Do not change the date in the field.

Land Class Definitions

Item 8--Oc4 ground land class

2-digit code that describes the ground land class (GLC) of the condition class. Code for all forest, other forest, and nonforest condition classes that are within inventoried area at Oc4.

Forest land (codes 20-50)

Land that is, or has been, at least 10-percent stocked by trees, and is not developed for nonforest use. 10-percent stocking is equated with 10-percent crown cover or 10-percent of normal yield table values (see Appendix 3 to determining stocking level). Land may be developed for nonforest use even though tree cover is present. Indications of nonforest use may include the presence of fences or structures, the clearing of stumps, extreme grazing, the absence of forest vegetation, evidence of human habitation and use around maintained structures such as landscaping, gardens, lawns, and play areas. The absence of forest vegetation means that some or all layers of the vegetation present--trees, shrubs and forbs--differ from what one would expect on forest land undisturbed by nonforest use; for example, a fenced, farm-lot may have forest trees present, but if extreme, sustained grazing has severely diminished or eliminated forest shrub and forb communities and tree regeneration is stifled, the farm-lot is likely nonforest. (In Oregon, grazing, common on forest lands, is rarely reason to classify a plot as "developed for nonforest use" unless a situation similar to the example is encountered).

Land that is, or was formerly, at least 10-percent stocked with trees on which urban development is imminent is still forest land; for example, if a plot location falls in a forested tract of several undeveloped lots in a subdivision and the tract meets minimum area, width and length requirements, the plot is forest land.

Tree Definition:

A tree is a woody plant that has an erect perennial stem or trunk at maturity that is at least 7.5 cm in diameter at breast height (1.37 meters) and a total height of at least 4 meters. (Ag. Handbook No. 541, 1979, ed., p. 3).

Other Forest Land (codes 41-50)

Forest land incapable of potentially producing at least 1.4 cubic meters/hectare/year in continuous crops of industrial roundwood because of species and/or adverse site conditions such as sterile soils, moisture stress, poor drainage, harsh environments, or rockiness. Other forest land is assigned the following classifications:

Forest land and other forest codes and definitions are shown on the following page:

Code	Ground land class	Definition
20	Timberland	Forest land which is potentially capable of producing at least 1.4 cubic meters/hectares/year (20 cubic feet/acre/year at culmination in fully stocked, natural stands) of continuous crops of trees to industrial roundwood size and quality and which is not withdrawn from timber utilization. Industrial roundwood requires species that grow to size and quality adequate to produce lumber and other manufactured products (exclude fence posts and fuel wood which are not considered manufactured). Timberland is characterized by no severe limitations on artificial or natural restocking with species capable of producing industrial roundwood.
41	Other forest-rocky	Other forest land which can produce tree species of industrial roundwood size and quality, but which is unmanageable because the site is steep, hazardous, and rocky, or is predominantly nonstockable rock or bedrock, with trees growing in cracks and pockets. Other forest-rocky sites may be incapable of growing continuous crops due to inability to obtain adequate regeneration success.
43	Other forest-pinyon-juniper	Areas currently capable of 10 percent or more tree stocking with forest trees, with juniper species predominating. These areas are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. 10 percent juniper stocking means 10 percent crown cover at stand maturity (see Appendix 3b.).
44	Other forest-oak	Areas currently 10 percent or more stocked with forest trees, with low quality forest trees of oak, gray pine, madrone, or other hardwood species predominating, and which are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. Trees on these sites are usually short, slow growing, gnarled, poorly formed, and generally suitable only for fuel wood. The following types are included: blue oak, white oak, live oak, oak-gray pine.
45	Other forest-chaparral	Areas covered with heavily branched dwarfed trees or shrubs, usually evergreen, the crown canopy of which currently covers greater than 10 percent of the ground. The principal species are dwarf <u>Quercus</u> , <u>Cercocarpus</u> (except <u>Cercocarpus ledifolius</u>), <u>Garrya</u> , <u>Ceanothus</u> , <u>Arctostaphylos</u> , <u>Baccharis</u> , and <u>Adenostoma</u> . Areas in which the predominate cover is <u>Artemisia</u> , <u>Purshia</u> , <u>Gutierrezia</u> , <u>Opuntia</u> , or semi-desert species are considered nonforest.
46	Other forest-unsuitable site	Other forest land which is unsuited for growing industrial roundwood because of one of the following environment factors: willow bogs, spruce bogs, sites with high water tables or even standing water for a portion of the year, and harsh sites due to climatic conditions. Trees present are often extremely slow growing and deformed. Examples: whitebark pine or mountain hemlock stands at timberline, shore pine along the Pacific Ocean, willow wetlands with occasional cottonwoods present, and sitka spruce-shrub communities bordering tidal flats and channels along the coast. Aspen stands in high-desert areas or areas where juniper/mountain mahogany are the predominate species are considered other forest-unsuitable site.
49	Other forest-low site (see cautionary paragraph below)	Forest land capable of growing crops of trees to industrial roundwood quality, but not able to grow wood at the rate of 1.4 cubic meters/hectare/year. Included are areas of low stocking potential and/or very low site index. Please read the cautionary paragraph below about the use of this land class.
50	Other forest-curleaf mountain mahogany	Areas currently capable of 10 percent or more tree stocking with forest trees, with curleaf mountain mahogany species predominating. These areas are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. 10 percent mahogany stocking means 10 percent crown cover at stand maturity.

Caution about other forest, low site (49): Some plots were assigned a GLC 49 at Oc3 which is printed/downloaded for condition class 1. If condition class 1 is still forest land, enter 49 for Oc4 GLC and leave Oc3 GLC as 49. If you believe condition class should be other than "other forest-low site", explain on the Plot Record in "CONTACT OFFICE ABOUT" and submit to lead techniquer. Do not code "other forest-low site" for forest condition classes other than 1 on remeasured plots or for new plots in the Oc4 inventory; if you think it should be a 49, give it a 20 (timberland), explain in writing why you feel the condition class is "Other forest-low site", and submit to the lead techniquer.

Nonforest land (codes 63-92)

Land not qualifying as forest land. Includes land that has never supported forest growth, and land once forest land but now developed for nonforest use such as crops, pasture, residential areas, highways, airstrips, etc. Areas of water 0.4 hectares to 1.8 hectares in size or streams ≥ 10 meters and < 61 meters in width will also be classified as nonforest. Census water, areas of water larger than these, is excluded from the gross area of the inventory unit. Christmas tree farms are classed as nonforest.

Nonforest ground land codes and definitions are shown in the following tabulation:

Code	Ground land class	Definition
63	Grassland/steppe or high desert shrub land.	Includes highly impacted areas with no irrigation and with $\geq 10\%$ shrub/grass/forb cover.
64	Cropland, irrigated grassland	Irrigated grassland includes areas with irrigation systems and fences. Also includes areas with highly impacted vegetation and $< 10\%$ shrub/grass/forb cover remaining.
66	Cultural nonforest stringers	Constructed roads, power lines, pipelines, canals, and railroads. No minimum width but must be ≥ 0.4 hectare in size.
67	Urban	Town sites and clustered suburbs, residential industrial buildings, city streets, developed parks, and farmsteads. Isolated developments surrounded by forest land do not have to be ≥ 0.4 hectare in size.
68	Naturally non-vegetated	Barren rock, sand, pumice, lava, glaciers
69	Christmas tree farms and tree nurseries.	
92	Water	Includes lakes that are 0.4 to 1.8 ha. in size and streams that are between 10 and 61 meters wide.
98	Census water	Includes lakes greater 1.8 ha. in size and streams greater than 61 meters wide. Area is an out-of-inventory condition class with a sample kind of 0 and an Oc4 owner code of 98

Oc4 GLC is the same as Oc3 GLC for condition 1 unless the condition class was not within inventoried area at Oc3 or unless the ground land class really changed since Oc3. If either Oc4 GLC or Oc3 GLC for condition class 1 are changed in the field, note on the Plot Record in "CONTACT OFFICE ABOUT" and submit to lead techniquer.

Item 9--Oc3 ground land class

A 2-digit code is printed/downloaded into condition class 1 for plots that were classified within inventoried area at Oc3. This item is the ground land class of condition class 1 at Oc3. If this printed/downloaded code seems incorrect and is not coded 49 (other forest-low site), update it and code Y in "Oc3 GLC UPDATED?" and note the reason in "IF Yes, Explain" on the Plot Record. Do not change Oc3 GLCs that are 49.

Item 10--Basal Area Factor

A 2-digit code printed/downloaded into condition class 1 showing the basal area factor of the prism used to tally 12.5 cm. d.b.h. trees on Oc3 5-point variable-radius plots. Remeasured variable-radius plots will use the same prism used at Oc3. A 30-factor prism will be used on all new variable radius-plots.

Item 11--Precipitation

A 3-digit code printed/downloaded into condition class 1 if recorded in a previous inventory. This item shows average annual precipitation in centimeters on the plot. Do not change the downloaded/printed code. Leave this item blank if no code was printed/downloaded. Do not code for other condition classes.

Item 12--Elevation

A 3-digit code printed/downloaded into condition class 1 if recorded in a previous inventory. This item shows the elevation to the nearest meter on the plot. Do not change the printed/downloaded code. Leave this item blank if no code was printed/downloaded. Do not code for other condition classes.

Item 13--Hydrologic unit code

A 12-digit code printed/downloaded into condition class 1. This item identifies the watershed in which the field grid point is located. Do not change the printed/downloaded code. Leave this item blank if no code was printed/downloaded. Do not code for other condition classes.

Item 14--Condition class aspect

Record a 3-digit azimuth indicating the direction of slope for the land surface of the condition class. Code for each forest land condition class. Apply the same coding system as used for subplot aspect (see page 45). Use the aspects recorded by subplot as one aid to determine aspect by condition class. If the aspect is equally SE, S, SW, code the azimuth of the S aspect. If the aspect is SE, S, SW, but 80 percent of the condition class is SE; code the azimuth of the SE aspect. A 2-character code is printed/downloaded into condition class 1 if recorded in a previous inventory. Update this code with a 3-digit azimuth.

Item 15--Condition class slope

A 2-digit code printed/downloaded into condition class 1 if recorded in a previous inventory. Enter the average percent slope for each forest land condition class. Use the slope percentages recorded by subplot as one aid to determine slope by condition class average (see page 46). You may record the exact slope or round to nearest 5 percent.

Item 16--Topographic Position

A 1-digit code printed/downloaded into condition class 1 if recorded in a previous inventory. Enter the code that best describes topographic position for each forest land condition class. Apply the same coding system used for subplot topographic position (see page 46). Use the topographic positions recorded by subplot as one aid to determine topographic position by condition class average.

Item 17--Soil depth

1-digit code printed/downloaded for condition class 1 if recorded in a previous inventory. This item describes soil depth within each forest land condition class. Required for all forest condition classes. Code this item "1" when more than half of area in the condition class is estimated as less 50 cm. deep.

Code	Definition
1	<50 cm
2	≥50 cm

Item 18--Harvest before Oc3

A 1-digit code which describes the most recent harvest occurring prior to Oc3. The code is printed/downloaded for condition class 1 if recorded in a previous inventory. Update this downloaded/printed code if obviously incorrect. Required for all forest condition classes except chaparral.

On plots visited for the first time at Oc4, use July, 1988 as the date of the Oc3 inventory when determining most recent disturbance before Oc3. Do not record harvests which occurred prior to 1900.

Definition of Harvest:

"Harvest" is the cutting of trees that were live and ≥ 12.5 cm. d.b.h., or the killing of trees by wildfire. Harvest does not include prescribed burns, which are recorded in "Silvicultural treatment since Oc3" on page 66.

The codes, kind of harvest, and definitions are listed in the following tabulation:

Code	Abbreviation	Definition
0	None	
1	Clearcut	Residual trees of all sizes have <25 percent crown cover. The residual trees usually are cull trees and low-value hardwoods. Not a firewood or local use harvest.
2	Heavy partial ($\geq 20\%$ removed)	Remaining trees comprise >25 percent crown cover and ≥ 20 percent of the trees live and 12.5 cm. d.b.h. or larger were harvested. The residual stand usually consists of commercially desirable trees. Not a firewood or local use harvest.
3	Light partial (<20% removed)	Remaining trees comprise >25 percent crown cover and <20 percent of the trees live and 12.5 cm. d.b.h. or larger were harvested. The residual stand usually consists of commercially desirable trees. Not a firewood or local use harvest.
4	Firewood or local use	The harvest of trees for firewood, or the harvest of trees for products manufactured and used locally by "do-it-yourselfers", often on the ownership of origin, for improvements such as buildings, bridges and fences.
5	Incidental	Includes 1) the haphazard, seemingly random harvest of occasional trees in an otherwise undisturbed stand, or 2) the harvest of one or more trees sampled or reconstructed as live at Oc3 in a harvest activity which occurred primarily in an adjacent unmapped condition class but slopped over a bit into a mapped condition, or 3) any harvest activity that does not qualify as another kind of disturbance.
6	Wildfire	Killing of trees by natural or human-caused fire activity. Does not include prescribed burns (see page 66). Includes areas which burned because a prescribed burn or site prep burn escaped

Item 19--Year of harvest before Oc3

A 2-digit code which describes the date of the most recent harvest prior to Oc3. The code is printed/downloaded for condition class 1 if recorded in a previous inventory. Update this printed/downloaded code if obviously incorrect. If Item 18 is coded for a harvest type of 1 through 5, this item must be assigned a year.

Item 20--Disturbance before Oc3

A series of 2-digit codes which describe the most recent disturbances occurring prior to Oc3. Required for all forest condition classes except chaparral. Record up to three disturbances, starting with the most recent. Enter "00" if no previous disturbances are observed.

On plots visited for the first time at Oc4, use July, 1987 as the date of the Oc3 inventory when determining most recent disturbance before Oc3. Do not code disturbances which occurred prior to 1900.

Code the following disturbances if they affect greater than 10% of the condition class area, or if the cruiser believes that the disturbance is having a significant impact on water quality, wildlife, tree establishment, development or survival, or any other physical/biological attribute of the condition class. Both "positive" and "negative" impacts may be recorded. Further description or clarification may be included in the "Present condition/past disturbance" section of the plot card.

Codes for kinds of disturbances since the previous inventory are shown in the following tabulation:

Code	Kind of Disturbance Agent	Disturbance Category
00	No disturbance	No Disturbance
01	Mining/excavation	Human caused
02	Landslides	Human caused
03	Toxic effluents	Human caused
04	Smelter or other atmospheric pollutants	Human caused
05	Dumping of trash or vehicles	Human caused
06	Trails/shooting/picnic area	Human caused
07	Chaining or cutting of juniper (left onsite)	Human caused
08	Herbicide spraying	Human caused
09	Urban/suburban influences (pets, etc.)	Human caused
10	Other human disturbances	Human caused
11	Landslide slump	Weather
12	Avalanche	Weather
13	Flooding/high water	Weather
14	Windthrow	Weather
15	Other weather related disturbances	Weather
16	Extreme grazing	Animals
17	Heavy browsing	Animals
18	Bear damage	Animals
19	Porcupine damage	Animals
20	Other animal disturbances	Animals
21	Insects	Other natural
22	Disease	Other natural
99	Other (describe on plot card)	Other

Item 21--Harvest since Oc3

A 1-digit code describing harvest since the Oc3 inventory. Code for each forest condition class except chaparral and code for each nonforest condition class that was forest land at Oc3 other than chaparral at Oc3. Codes listed for Item 18 apply for this item.

On plots (or condition classes) visited for the first time at Oc4, use July, 1987 as the date of the Oc3 inventory when determining most recent harvest since Oc3.

If one or more tally trees has a tree history of 8, then "Harvest since Oc3" must be coded 1, 2, 3, 4, or 5, "Year of harvest since Oc3" requires a specific year entered, and "Type of logging" must be coded 1, 2, 3, 4, 5, or 6. If "Harvest since Oc3" is coded other than 0 or 6, then Item 22--"Year of harvest since Oc3" requires a year entered.

"Harvest since Oc3" aids users of data to track the history of stand development. It is used in timber supply projections, and it provides information for harvest studies.

Item 22--Year of harvest since Oc3

If a harvest was coded in Item 21 for a condition class, record a 2-digit code for the year that the harvest occurred since Oc3. A disturbance in 1991 is coded 91. If a 0 or 6 was recorded in Item 21, leave this item blank. If a year is entered, "Item 23--Year of harvest since Oc3 confirmed?" requires coding.

Rely on the best available information in determining the year of harvest. Within a condition class on which harvest has occurred, the freshness of stumps, slash and degree of revegetation are indicators of year of disturbance. The age of the regeneration stand may provide a "yardstick" to date the harvest, but remember to account for the time elapsed between disturbance and planting. In partial cuts, one can estimate year of disturbance by boring residual trees in order to count the number of rings since release; this technique may also be applied to clearcuts by boring trees located in adjacent stands that are on the clearcut boundary. When dating by boring, consider whether to add an extra year (or years) as release often is not evident in the first year following harvest.

Item 23--Year of harvest since Oc3 confirmed?

A 1-character code which indicates if the year of harvest since Oc3 is confirmed or merely estimated. Record "Y" if the year is known absolutely; otherwise, enter "N". Code for each condition class which has a specific year entered for "Item 22--Year of harvest since Oc3".

Confirming the year of harvest: This may be done in a variety of ways. Prior to visiting a plot, the field coordinator or crew can "prescreen" the photos for disturbance and, if signs of harvest or fire are present, inquire of the owner during a contact to gain access or check with the owner or a near-by neighbor after leaving the plot. A general rule of thumb: apply your ingenuity in confirming the year of harvest, but do so in a manner that incurs little cost. If confirmation requires more than 15 minutes, the cost is likely excessive; however, as a minimum, make an estimate for year of harvest based on field observations made on the plot.

Item 24--Disturbance since Oc3

A series of 2-digit codes which describe the most recent disturbances occurring since Oc3. Required for all forest condition classes except chaparral. Use the same codes and procedures used for "Item 20--Disturbance before Oc3".

Item 25--Silvicultural treatment since Oc3

A 2-digit code that describes silvicultural treatments occurring since the Oc3 inventory. Required for all forest condition classes except chaparral. Code only for activities within forest condition classes that have occurred within 16.95 meters of subplot centers on the standard layout. Use combinations of codes to record multiple treatments. For example, 41 indicates that site preparation and planting occurred.

Code	Label	Definitions
00	No treatment	
01	Planting	Planting the area to establish a manageable stand.
02	Plant holes	Planting of nonstocked openings to fill-in or create a manageable stand
03	Precommercial thin	An intermediate harvest in which excess growing stock are cut but not removed.
04	Site preparation	Preparation of the site for the establishment of a new, manageable stand. The treatment reduces or eliminates hardwoods, brush, ferns, slash, and other inhibiting materials. Soil may be furrowed.
05	Clean and release	Killing or suppression of undesirable, competing vegetation--usually brush or hardwoods--from a manageable stand. A herbicide treatment in young, regenerated stands is one method of clean and release.
06	Underplant	Planting under a sawtimber overstory.
07	Improvement cut	Cutting of commercial-sized, unsalable trees to free crop trees from competition. Improvement cutting differs from a commercial thinning in that the trees cut are not marketable.
08	Stand conversion	Killing of low-value or unmarketable trees--often hardwoods--and planting of the area to establish a manageable stand. Most commonly, low-value hardwood stands are converted to conifer stands.
09	Prescribed burning (other than site preparation)	Controlled burning to reduce fuel loads or tree stocking in an operation other than site preparation.

Item 26--Type of Logging

A 1-digit code that indicates the type of logging system most recently used to harvest or convert in the previous or present stand. Required for all forest condition classes except chaparral. If Item 21 is coded for harvest since Oc3, this item must be coded other than 7 (no harvest has ever occurred). This information is used to evaluate timber extraction costs.

The codes for the type of logging system utilized are shown in the following tabulation:

Code	Type of Logging System
1	Previous stand was clearcut using a cable system
2	Previous stand was clearcut using crawler tractors, rubber-tired skidders, or mobile feller-bunchers.
3	Previous stand was clearcut, but the type of logging system is unknown or used helicopters.
4	Partial, seed tree or shelterwood harvest has occurred in the present stand using a cable system.
5	Partial, seed tree or shelterwood harvest has occurred in the present stand using crawler tractors, rubber-tired skidders, or mobile feller-bunchers.
6	Partial, seed tree or shelterwood harvest has occurred in the present stand, but the type of logging system is unknown or used helicopters.
7	The site has never been harvested or converted.

Item 27--Forest Type

A 3-digit code indicating the predominate tree species of the present stand. Record for all forest condition classes except chaparral. Valid codes are the tree species codes on page 101.

If the condition class is characterized by a scattering of overstory trees with <10 percent cover and an understory of young trees with ≥ 10 percent cover or stocking, base forest type on the predominate tree species in the understory. If the condition class is assigned "6" (nonstocked) in "Item 28--Stand size", code forest type as "99".

Item 28--Stand Size

A 1-digit code indicating the size of the present stand. Record for all forest condition classes except chaparral.

The codes, classifications, and definitions for stand size are shown in the tabulation below:

Code	Stand size class	Definition
1	Seedlings and saplings	The average diameter of live trees in the condition class is <12.5 cm. d.b.h. and ≥ 100 free-to-grow seedlings and saplings per average acre are distributed broadly across the condition class
2	Poletimber	The average diameter of live trees in the condition class is 12.5 to 22.4 cm. d.b.h. and tree canopy cover is ≥ 10 percent.
3	Small sawtimber	The average diameter of live trees in the condition class is 22.5 to 53.3 cm. d.b.h. and tree canopy cover is ≥ 10 percent.
4	Large sawtimber	The average diameter of live trees in the condition class are ≥ 53.4 cm. d.b.h. and tree canopy cover is ≥ 10 percent.
6	Nonstocked	1) The average diameter of live trees in the condition class is <12.5 cm. d.b.h. and <100 free-to-grow seedlings and saplings per average acre are distributed broadly across the condition class. Or: 2) the average diameter of live trees in the condition class is ≥ 12.5 cm. d.b.h. and tree canopy cover is <10 percent. Or: 3) the condition class was recently clearcut and has not been replanted.

Item 29--Stand Age

A 2-digit code indicating the predominate total age class of the predominate trees in the present stand. Record for all forest condition classes except chaparral.

The age codes represent 10-year age categories for both even-aged and uneven-aged stands. To be an even-aged stand, the stand must be at least 10 percent stocked with trees and 70 percent of the trees must be within 30 years of one another. If at least 10 percent stocked but <70 percent of the trees are within 30 years of one another, the stand is uneven-aged and the predominate age class should be recorded. If Item 28 was coded as nonstocked ("6"), less than 10-percent stocking is assumed and stand age for the condition class is coded "99".

The codes used to describe stand age for even-aged and uneven-aged stands are listed on the following page:

Stand Age	Even-aged Code	Uneven-Aged Code
00-09	01	51
10-19	02	52
20-29	03	53
30-39	04	54
40-49	05	55
50-59	06	56
60-69	07	57
70-79	08	58
80-89	09	59
90-99	10	60
100-109	11	61
110-119	12	62
120-129	13	63
130-139	14	64
140-149	15	65
150-159	16	66
160-169	17	67
170-179	18	68
180-189	19	69
190-199	20	70
200-299	21	71
300+	22	72
Nonstocked	99	99

Item 30--Plant Association

A 6-digit code describing the predominant plant association of the condition class. Recorded for each forested condition class (GLCs 20-50). This code may be preprinted/downloaded for condition class 1 on remeasured plots.

The plant association guide to be used for each plot will be written on the plot jacket.

The first two digits of the plant association identify the predominant or climax species and are listed on the following page.

Code	Plant Community Association
CX	Coniferous forest
CA	Sub-alpine fir, mountain hemlock, whitebark pine (open forest)
CC	Western redcedar
CD	Douglas-fir
CE	Sub-alpine fir, Englemann spruce (closed forest)
CF	Silver fir, noble fir
CH	Western hemlock
CJ	Juniper, pinyon pine
CL	Lodgepole pine (climax or seral)
CM	Mountain hemlock
CP	Ponderosa, Jeffrey pine
CW	White fir, grand fir
HX	Hardwood forest
HA	Alder
HB	Bigleaf maple
HC	Cottonwood, ash bottomland, overflow bottomland
HO	Oregon white oak
HQ	Quaking Aspen

The third through sixth digits of the plant association code should be entered for all forested condition classes with a sample kind 1-3 in areas covered by the plant association guides.

- *Plant Associations of the Wallowa-Snake Province (Wallowa-Whitman National Forest)* by Charlie Johnson
- *Plant Communities of the Blue Mountains in Eastern Oregon and Southeastern Washington* by Fred Hall
- *Plant Communities of the Central Oregon Pumice Zone* by Len Volland
- *Plant Associations of the South Chiloquin and Klamath Ranger Districts - Winema National Forest* by William Hopkins
- *Plant Associations of the Fremont National Forest* by William Hopkins
- *Plant Associations of the Crooked River National Grassland, Ochoco National Forest* by William Hopkins and Bernard Kovalchik
- *Plant Associations of the Warm Springs Reservation* by Frank Marsh
- *Plant Association and Management Guide for the Ponderosa Pine, Douglas-fir, and Grand Fir Zones - Mt. Hood National Forest* by Christopher Topik, Nancy Halverson, and Tom High.
- *Plant Association and Management Guide for the Pacific Siver Zone - Mt. Hood and Willamette National Forests* by Miles A. Hemstrom, William H. Emmingham, Nancy M. Halverson, Sheila E. Logan and CHristopher Topik.
- *Plant Association and Management Guide for the Mountain Hemlock Zone - Gifford Pinchot and Mt. Hood National Forests* by Nancy M. Diaz, C. Tom High, T Kim Mellen, Diane E. Smith, and Christopher Topik.

Item 31--Stand Condition

A 1-digit code that describes the condition of the stand within forest condition classes. Stand condition is defined here as "the size, density, and species composition of a plant community following disturbance and at various time intervals after disturbance." Information on stand condition is used in describing wildlife habitat.

The code is printed/downloaded for condition class 1 if recorded at Oc3 on plots with an Oc3 ground land class of 41 or 46. Update this printed/downloaded code if obviously incorrect. Record for all forest condition classes; condition classes that are other forest-chaparral, juniper or curleaff mountain mahogany are always coded "0".

Code	Stand Condition	Definition
0	Not applicable	Condition class is other forest-juniper, other forest-chaparral or other forest-curleaff mountain mahogany (GLC 43, 45 or 50).
1	Grass-forb	Shrubs less than 40% crown cover and less than 1.5 m. tall; plot may range from being largely devoid of vegetation to dominance by herbaceous species (grasses and forbs); tree regeneration generally less than 1.5 m. tall and 40% cover.
2	Shrub	Shrubs 40% crown canopy or greater, of any height; trees less than 40% crown canopy and less than 2.5 cm. d.b.h. When average stand diameter exceeds 2.5 cm. d.b.h., plot is "open sapling" or "closed sapling."
3	Open sapling-poletimber	Average stand diameter 2.5-22.9 cm. d.b.h., and tree crown canopy poletimber is less than 60%.
4	Closed sapling, pole, sawtimber	Average stand diameter is 2.5-53.3 cm. d.b.h. and crown cover is 60% or greater.
5	Open sawtimber	Average stand diameter is 23.0-53.3 cm. d.b.h., and crown cover is less than 60%.
6	Large sawtimber	Average stand diameter exceeds 53.3 cm. d.b.h.; crown cover may be less than 100%; decay and decadence required for old-growth characteristics is generally lacking, successional trees required by old-growth may be lacking, and dead and down material required by old-growth is lacking.
7	Old-growth	Average stand diameter exceeds 53.3 cm. d.b.h. Stands over 200 years old with at least two tree layers (overstory and understory), decay in living trees, snags, and down woody material. Some of the overstory layer may be composed of long-lived successional species (i.e. Douglas-fir, western redcedar).

Item 32--Crown Closure at Oc3

A 2-digit code required on Oc3 forest plots 1) to which access is denied at Oc4 and 2) on which harvest occurred since Oc3. If harvest occurred, record the percentage of overstory tree cover present at Oc3 within the Oc3 plot area. Record to the nearest 5 percent. If harvest occurred, Recorded for the entire plot and not by condition class. If coded, Item 33 also requires an entry. See Appendix 6, "Access-denied plots" on page 186 for related instructions.

Harvest is detected by comparing Oc3 and Oc4 photographs or by relying on-the-ground assessment from an accessible view point. If harvest occurred, interpret the percentage of Oc3 cover within Oc3 plot area using the Oc3 photographs.

Item 33--Crown Closure at Oc4

A 2-digit code required on Oc3 forest plots 1) to which access is denied at Oc4 and 2) on which harvest occurred since Oc3. If harvest occurred, record the percentage of overstory tree cover present at Oc4 within the Oc3 plot area. Record to the nearest 5 percent. See Appendix 6, "Access-denied plots" on page 186 for related instructions.

Harvest is detected by comparing Oc3 and Oc4 photographs or by relying on-the-ground assessment from an accessible view point. If harvest occurred, interpret the percentage of Oc4 cover within Oc3 plot area after harvest by 1) comparing Oc3 and 4 photographs if the harvest occurred before the date of the Oc4 photos or 2) by on-the-ground estimation if feasible and it is clear that the harvest occurred after the date of the Oc4 photos.

Item 34--Oc3 remeasurement period

A 2-digit code indicating the number of years used to determine the increment period between Oc3 and Oc4. The data recorder will automatically enter the measurement period for new and remeasured plots, but the crew should check that it is entered and is correct.

Item 35--Oc3.5 remeasurement period

A 1-digit code indicating the number of years used to determine the increment period between Oc3.5 and Oc4. The data recorder will automatically enter the measurement period for new and remeasured plots, but the crew should check that it is entered and is correct.

Additional instructions for Items 18 through 31

Two guidelines apply when coding Items 18 through 31:

- Base Item 18 through 31 on what is generally present in the forest condition class, and not just that portion of the condition mapped on the 17-meter fixed-radius plots or mapped within the general plot area .

Example: A forest condition class is mapped only at one subplot and the trees tallied within the mapped area are all red alders. The overall area of the condition class, however, is 25 acres in size, and 90 percent of the overstory trees across these acres are Douglas-fir. Code forest type for the condition class as Douglas-fir, not red alder.

- If two forest stand conditions are present but too small to be recognized separately, condition class attributes should be based on the individual stand condition which occupies the most plot area. If tied, base the attribute classifications on the stand condition with the tallest overstory tree layer. Include comments in "Present condition, past disturbance" that describe the situation.

Example: Two forest conditions, a seedling-sapling stand and a small sawtimber stand, are present but too small in area to be recognized as separate mapped condition classes. Within the plot area, the seedling-sapling stand occupies the most area. The mapped condition class which is comprised of both the seed-sap stand and the adjacent small sawtimber stand is given a stand size classification of "seedling-sapling stand". Do not average attribute classifications in this kind of situation; in the example, do not assign "poletimber" as stand size simply because its "halfway" in size class between "seedling-sapling" and "small sawtimber".

VI. SITE INDEX

TABLE OF CONTENTS

VI. SITE INDEX.....	75
A. Introduction.....	75
B. Site trees: general instructions.....	75
Previously visited plots.....	75
New plots.....	75
C. Selecting site trees: general instructions.....	76
D. Selecting site trees: tree criteria.....	76
E. Site tree data.....	77
Item 1--Site Tree number (#).....	77
Item 2--Subplot number (SUB PL).....	77
Item 3--Condition class (CC).....	77
Item 4--Tree number (TRN).....	77
Item 5--Azimuth (AZ).....	77
Item 6--Species (SPC).....	77
Item 7--D.b.h. (DBH).....	77
Item 8--Height (HT).....	77
Item 9--Breast-height age (BH AGE).....	77
Item 10--Site Index (SI).....	78
Item 11--Site index equation number (EQ).....	78
F. Site trees: post-field review.....	78

VI. SITE INDEX

A. Introduction

Site index, a simple numerical value based upon tree height at a specified age, is commonly used to evaluate the potential productivity of tree growth on a forest site. On sites where soil moisture is adequate and soils are not toxic to tree growth, site index correlates well with the maximum potential stand volume and number of trees a site can attain at stand maturity. However, on sites with droughty or toxic soils, or otherwise unsuitable conditions, these maximums are reduced to levels lower than would otherwise be expected. On these impaired sites, site index alone does not correlate well with potential productivity.

On these sites, an estimate of stand density index (SDI) is required to assess productivity adequately; stand density index is the maximum number of trees per acre a site will support when stand d.b.h. is 10 inches (Reinke's stand density index) relative to the maximum expected number if the site were not impaired. An estimate of SDI for an impaired site can be compared with the stand density index expected on a similar, but unimpaired site to determine by how much to reduce estimates of potential productivity; the proportion of these two stand density indices is used to discount maximum potential stand density and tree growth (mean annual increment at culmination in a normal, fully stocked stand (MAI)).

SDI on a given site correlates well with the presence of specific combinations of key plant species, plant communities, and abiotic attributes. This information is collected as a part of the plant association data recorded in the condition class attributes section (page 68). The plant association will allow us to estimate the maximum potential SDI possible on a plot. We will use this estimate to determine to what extent, if any, the potential productivity (MAI) estimated using the plot's site index should be discounted.

B. Site trees: general instructions

Each plot with a timberland, other forest land-low site, or other forest land-rocky (GLC 20, 41, and 49) condition class mapped on one or more subplots on the standard layout is assigned a site species and site index. These variables are based on site trees collected on the plot.

Select and measure site trees if instructed to do so on the plot review sheet. In general, the reviewer has called for site tree data when site index information is incomplete, absent, or unreliable.

Previously visited plots

On many plots visited previously, the reviewer will recommend that no additional site trees are needed. For these plots, no action is required on site trees unless the crew feels that the plot-level site index listed on the Oc3 plot card is not realistic. If this occurs, the crew should collect, if available, additional site trees that support their claim and should document their case in "Present Condition/Past Disturbance" on the PLOT RECORD.

On previously visited plots needing additional site trees, the reviewer has recommended what the crew needs to attempt. For these plots, the reviewer edited the site tree data collected during past inventories, and the trees that passed review are printed/downloaded. The crew should recommend if these trees should be dropped as site trees because they are not representative of forest land within the plot area; do this by writing comments in "Present condition/Past disturbance" on the PLOT RECORD. Do not delete or change downloaded site tree records except to add the condition class number; to update one of these trees, enter a new record.

New plots

On new plots, at least site trees, if available, should be collected if any part of a subplot (16.95-meter fixed-radius plot) is in a condition class that is timberland (GLC 20), other forest-low site (GLC 49), or other forest-rocky (GLC 41).

New plots include the following:

- plots visited for the first time,
- plots visited previously that can not be found,
- Oc3 plots consisting of one 16.95-meter fixed-radius vegetation profile plot (Oc3 GLC is 41, 45 or 46, on the Oc3 plot card) that is being replaced with a new 5-subplot plot that has at least one mapped condition class that is timberland (GLC 20), other forest-low site (GLC 49), or other forest-rocky (GLC 41).
- Oc3 plots classified as nonforest but having at least one mapped condition class that is timberland (GLC 20), other forest-low site (GLC 49), or other forest-rocky (GLC 41).

C. Selecting site trees: general instructions

1. If the plot is a hardwood site select the dominant tree species for site trees. A hardwood site is timberland that is a wetland site incapable of growing a manageable conifer stand, i.e. cottonwood flats along streams, Oregon ash stands on low, wet ground.
2. If the plot is a conifer site select only conifer site trees. A conifer site is any timberland site not meeting the hardwood site definition above.
3. In mixed conifer stands, Douglas-fir and ponderosa pine are preferred. If possible, use the species that dominates the site.
4. In lodgepole pine stands, look for lodgepole site trees.
5. Tree species should be the same for all site trees on a plot. Exception: grand fir and white fir.
6. Site index should not vary by more than 30 between site trees unless the difference can be explained by actual site variation within the plot. If indices vary by more than 30, explain why in "Present Condition/Past Disturbance" on the PLOT RECORD.
7. The site trees should be representative of forest land across the plot area. However, if the plot includes timberland and other forest condition classes, select the trees only within the timberland condition class(es). Collect only one set of site trees per forest plot even though occasionally, average site index will vary significantly among different forest condition classes.
8. A forest plot should have at least three representative site trees. If no suitable site trees are available from the plot area, select trees from a nearby area with the same general aspect and elevation. If three trees still can not be obtained, get as many as possible and explain in "Present Condition/Past Disturbance" on the PLOT RECORD.

D. Selecting site trees: tree criteria

1. Select dominant trees.
2. Select trees that are and have been free from suppression for their entire lives. Be particularly careful when in residual stand from which the dominant trees have been harvested. A tree that has been suppressed will have closely-space annual growth rings on all or part of its' increment core.
3. If it is necessary to use true fir site trees, be very sure that they are not released understory trees.
4. Do not use cedar.
5. Trees greater than 50 years old are desirable, but younger trees may be selected if none are available. For ponderosa pine, trees 60 to 120 years old are most desirable, but younger trees may be used if needed.

6. Select site trees that show no signs of top-out, such as crooks and forks, unless these trees are taller than normally-formed trees of the same d.b.h.
7. Site trees should be evenly distributed across the plot area.

E. Site tree data

Each site tree requires the following items recorded:

Item 1--Site Tree number (#)

Record a 1-digit code indicating an assigned number for each site tree record on a plot. Numbers will be assigned before fieldwork to downloaded/printed site trees. The data recorder will automatically assign a number to each site tree new at Oc4.

Item 2--Subplot number (SUB PL)

Record a 2-digit code indicating the number of the subplot on which a site tree is on or near. Subplot numbers for site trees previously collected will be downloaded/printed if on file.

Item 3--Condition class (CC)

A 1-digit code indicating the condition class in which a site tree is located. Record for new site trees. Record for downloaded site trees if the condition class can be readily determined.

Item 4--Tree number (TRN)

A 3-digit code. If a site tree is a trackable tree at Oc4, and has a tree number tag, record the number. If a site tree is not a trackable tree at Oc4, but has a tree tag number from a previous inventory, record the number.

Item 5--Azimuth (AZ)

A 3-digit code. Record an azimuth for a new site tree. Azimuth is from the subplot center to the site tree. Record the azimuth even if the site tree is not within 16.95 meters of a subplot center.

Item 6--Species (SPC)

A 3-digit code. Species is downloaded for site trees previously collected. Code for new site trees. Use the species codes that are used for trackable trees on page 101).

Item 7--D.b.h. (DBH)

A 4-digit code recorded to the nearest millimeter. Downloaded for site trees previously collected. Record for new site trees.

Item 8--Height (HT)

A 3-digit code recorded to the nearest decimeter. Downloaded for site trees previously collected. If updating a downloaded site tree, measure the tree's current height and enter it on the new (second) record for the tree (be sure also to enter a current b.h. age on the new record). If a new site tree, measure and record current height.

Item 9--Breast-height age (BH AGE)

A 3-digit code indicating the tree's age at breast height. Downloaded for site trees previously collected. If updating a downloaded site tree, determine the number of years elapsed since the tree was taken as a site tree, add this number to the downloaded age and enter the sum on the new record for the tree (be

sure also to measure and enter the current height on the new record). If a new site tree, bore for age at breast height and record the age.

Item 10--Site Index (SI)

Downloaded for site trees previously collected. If a downloaded tree is updated for b.h. age and height, the data recorder will recalculate the tree's index. On a new site tree, the data recorder will calculate site index after the tree's species, height, b.h. age, and site index equation number are entered. If recording on paper, the index will be determined after the plot is entered electronically.

Item 11--Site index equation number (EQ)

A 1-digit code that indicates the site index equation that is used to compute site index. The equation number is downloaded for site trees previously collected. For new site trees, the Husky data recorder will enter the appropriate equation number after entry of species, height, and b.h. age.

Equation number	Species	Literature Reference
1	Douglas-fir, grand fir and white fir:	"Height growth and site index curves for Douglas-fir in high elevation forests of Oregon-Washington Cascades." Curtis, Herman and DeMars.
2	Noble fir, Pacific silver fir, subalpine fir, mountain hemlock:	"Research paper PNW-243." 1978. Curtis, Herman and DeMars.
3	Ponderosa pine	"Research paper PNW-232." 1978. Barrett.
4	Lodgepole pine	"Gross yield of central Oregon lodgepole pine." Dahms.
5	Western larch	"Research paper PNW-424." 1985. Cochran.
6	Red Alder	"Research paper PNW-36." 1960. Worthington, et. al.

F. Site trees: post-field review

Crew coordinators will review each plot which needed new or additional site trees. The coordinators will check site tree data is complete, satisfies site tree instructions and is written up as needed. Afterwards, the lead techniquer will review each plot for site trees and plot site index. Prior to the techniquer's review, no one should delete site trees that were downloaded or added at Oc4.

VII. VEGETATION PROFILE

TABLE OF CONTENTS

VII. VEGETATION PROFILE	81
A. General design instructions for vegetation profile plots	81
B. Species records	82
General procedures	82
Tree seedlings and shrubs.....	82
Forbs	83
Grasses and "grass-like" plants	83
Perennial grasses	83
Annual grasses	83
1. Species.....	83
Is it a tree or is it a shrub?	84
2. Canopy layer	85
3. Vegetation plot percent cover	85
4. Stage of development for shrubs	86
C. Vegetation profile plot - total cover and layers	86
1. Percent cover of "all shrubs", "all forbs" and "all grass"	86
2. Summary of canopy layer heights	86
3. Percent Bare Soil.....	87
4. Percent Total Vegetation Cover	87
D. Seedling Count.....	87
1. Pacific Yew seedling count	88
2. Seedling count - species other than Pacific Yew	88
E. Collection and identification of unknown plants	88

VII. VEGETATION PROFILE

Information on the structure and species composition of plant communities has many uses. The data is used to evaluate wildlife habitat, forage availability, grazing potential, species richness and abundance, fire hazard, and potential productivity in terms of biomass.

A. General design instructions for vegetation profile plots

In the most recent previous inventory (Oc3 in 1987) several different size vegetation profile plots were used. The vegetation plot was installed on the fixed-radius sapling plot used in tree selection. On all of the Oc3 plots measured in the Blue Mountains unit, and on a majority of the plots in the Central unit, a BAF 30 prism was used and a corresponding 2.41 meter fixed-radius plot was established.

Some plots in the Central unit with severe tree stocking limitations were measured at Oc2 with a BAF 20 prism and a 2.96 meter fixed-radius plot. These plots were remeasured at Oc3 with the same BAF prism and fixed-radius plot, which will again be used at Oc4.

The BAF used at Oc3 is shown on the Oc3 data sheets, the downloaded plot sheets, and the Husky vegetation tally program. At Oc4 all new field plots will be established using a BAF 30 prism and a 2.41 meter fixed radius plot.

In this chapter, the term 'vegetation profile plot' refers to a 2.41, 2.96 or 16.95 meter fixed-radius area where vegetation profile procedures are implemented on one individual subplot. Instructions pertaining to the entire group vegetation of profile plots across a field plot are specifically noted as such. A diagram of the standard plot layout is shown on page 19.

By subplot, do each of the following instructions if all of the criteria stated for the particular instruction are met:

1. If the subplot is on the standard layout, and a fixed-radius vegetation profile plot (2.41 or 2.96 meter radius) was taken at Oc3, and the subplot center is in a forest land condition class that is in inventoried area, remeasure the fixed-radius vegetation profile plot within the condition class present at subplot center.
2. If the subplot is on the standard layout, and a vegetation profile plot was not taken at Oc3, and subplot center is in a forest land condition class that is in inventoried area, and the subplot is not hazardous, establish a new 2.41 or 2.96 meter fixed-radius vegetation profile plot. Sample the vegetation profile plot within the condition class present at subplot center. Do not "reconstruct" (estimate what the Oc3 crew would have recorded) the profile.
3. If the subplot is an R subplot, and a 2.41 or 2.96 meter fixed-radius vegetation profile plot was taken at Oc3, and condition class 1 is forest land in inventoried area, remeasure the vegetation profile plot within condition class 1. Oc3 species data downloaded into the Husky data recorder for a R or substituted subplot are adopted for a new C or N subplot by changing the R or substituted subplot number to a C or N subplot number; upon this change, the Husky sets the Oc3 percentages of cover to 0 for all species entries on the subplot.
4. If the subplot is a X subplot, and a 2.41 or 2.96 meter fixed-radius vegetation profile plot was taken at Oc3, and condition class 1 is forest land in inventoried area, remeasure the vegetation profile plot within condition class 1. Oc3 species data downloaded into the Husky data recorder for a R or substituted subplot are adopted for a new C or N subplot by changing the R or substituted subplot number to a C or N subplot number; upon this change, the Husky sets the Oc3 percentages of cover to 0 for all species entries on the subplot.
5. If a single 16.95-meter fixed-radius vegetation profile plot was taken at Oc3, and the 16.95-meter plot was installed (1) at the field grid location (pinpricked location) or (2) at an R or X subplot that was located by moving from the field grid location, and subplot center is in a forest land condition class that is in inventoried area and is condition class 1, and the subplot area is not hazardous, remeasure the

vegetation profile plot within condition class 1 on the 16.95-meter plot. It is recorded in the vegetation profile portion of the Husky as subplot 11. Trees of all sizes, not just seedlings, are profiled on the 16.95-meter fixed-radius vegetation profile plot.

Additionally (per instruction 2), establish a 2.41 or 2.96 meter fixed-radius vegetation profile plot at the field grid location. Data for the new fixed-radius vegetation profile plot is entered on the data recorder. Do not "reconstruct" the profile taken on a new 2.41 or 2.96 meter plot.

6. If one or more subplots on the standard layout have subplot centers that fall in a forest land condition class that is in inventoried area, and all of these subplots in the condition class are too hazardous to establish, install, or remeasure a 16.95-meter fixed-radius vegetation profile plot at the lowest-numbered subplot center on the standard layout that is in the condition class. Sample vegetation profile within the condition class present at subplot center. If remeasuring an Oc3 16.95-meter plot, record by hand on the printed VEGETATION PROFILE RECORD; if not remeasured, the 16.95-meter plot is entered into the data recorder. Trees of all sizes, not just seedlings, are profiled on the 16.95-meter fixed-radius vegetation profile plot.

By this instruction, a plot may have more than one 16.95-meter vegetation profile plot taken at Oc4 if there is more than one forest condition class present whose subplots are all too hazardous. It is also possible, by this rule, to have a 16.95-meter plot taken in one or more forest condition classes and to have one or more 2.41 or 2.96 meter plots taken in other forest condition classes that are not hazardous. Only the first 16.95 meter vegetation profile plot is recorded on the Husky.

7. If a 2.41 or 2.96 or 16.95-meter fixed-radius plot straddles more than one condition class, evaluate vegetation profile only within the area of the condition class that includes the subplot center. Record the percentage of total vegetation plot area that this evaluated area represents in "% IN CC OF CENTER". Within the subplot diagram used for mapping condition class, each dark dot within the 2.41 or 2.96 meter circle represents 11.1 percent of the area of the circle. All discussion of vegetation profile procedures hereafter is in terms only of evaluated area. Only the presence of more than one condition class can reduce the area evaluated on a vegetation plot. Nonforest inclusions (<0.4 ha.) are not recognized as condition classes and therefore should not be reason for reducing the percentage of evaluated area.

B. Species records

General procedures

Individual species records are entered or updated. Individual species by layer are recorded within four plant groups: trees, shrubs, forbs and grass. Species records entered at Oc3 are downloaded/printed. A species is recorded if found on one or more vegetation profile plots taken across the field plot. On each species record, species and layer, and the percentage cover of the species by vegetation plot is entered.

Tree seedlings and shrubs

On 2.41 or 2.96 meter fixed-radius vegetation profile plots, enter or update a record for each shrub species by layer present in any amount and for each tree species present with one or more seedlings (<2.5 cm d.b.h.). Tally regardless of abundance or percentage of cover. If a tree or shrub species is present but covers less than 3 percent of evaluated area on a vegetation plot, Oc4 percent cover for the plot is recorded as "01"; if greater than 3 percent, record to the nearest 5 percent.

On **16.95-meter** fixed-radius vegetation plots only, enter or update a record for each tree and shrub species present regardless of tree size or abundance. If a tree or shrub species is present but covers less than 3 percent of evaluated area on a vegetation plot, Oc4 percent cover for the vegetation plot is recorded as "01"; if greater than 3 percent, record to the nearest 5 percent.

Forbs

On each 2.41 or 2.96 or 16.95-meter fixed-radius vegetation profile plot, update each downloaded forb species record; if an Oc3 forb was given a percent of cover greater than 0 on a vegetation plot at Oc3 and is still present but covers less than 3 percent of evaluated area on the vegetation plot at Oc4, record Oc4 percent cover as a "01". If a forb species record was entered at Oc3, but the species was assigned 0 percent of cover on the vegetation plot at Oc3 but now covers 3 or more percent of the evaluated area on the vegetation plot, enter the Oc4 percent of cover to the nearest 5 percent. If a forb species was not present at any vegetation plot at Oc3 but now covers 3 or more percent of evaluated area on a vegetation plot, enter a new record and estimate Oc4 percent of cover of the species to the nearest 5 percent on each vegetation plot.

Grasses and "grass-like" plants

On each 2.41 or 2.96 or 16.95-meter fixed-radius vegetation profile plot update each downloaded grass species record. Separate the downloaded Oc3 "GRASS" code into perennial and annual species codes.

Perennial grasses

All species present are tallied regardless of abundance or percentage of cover. If a perennial grass species (either downloaded from Oc3, or not recorded at Oc3) is present, but covers less than 3 percent of evaluated area on a vegetation plot, Oc4 percent cover for the plot is recorded as "01"; if greater than 3 percent, record to the nearest 5 percent. If an Oc3 perennial grass was given a percent of cover greater than 0 on a vegetation plot at Oc3 and is no longer present, record Oc4 percent cover as a "0".

Annual grasses

If an Oc3 annual grass was given a percent of cover greater than 0 on a vegetation plot at Oc3 and is still present but covers less than 3 percent of evaluated area on the vegetation plot at Oc4, record Oc4 percent cover as a "01". If a annual grass species record was entered at Oc3, but the species was assigned 0 percent of cover on the vegetation plot at Oc3 but now covers 3 or more percent of the evaluated area on the vegetation plot, enter the Oc4 percent of cover to the nearest 5 percent. If a annual grass species was not present at any vegetation plot at Oc3 but now covers 3 or more percent of evaluated area on a vegetation plot, enter a new record and estimate Oc4 percent of cover of the species to the nearest 5 percent on each vegetation plot.

Bromus Tectorum should be separated out if present, other annual grasses can be 'lumped' together if needed.

1. Species

Each species record must have a species code recorded in the "OC3 SPC" or the "OC4 SPC" column. Valid species codes are listed in the plant guide. If you cannot identify a species while in the field, collect a specimen for later identification (see page 88). If you cannot identify the species of the plant, record the code for its genus if possible. If not, record one of the following generic codes:

Unknown Species Code	Life-form	Lumped Species Code
SHRUB1	Shrubs	---
FORB1	Forbs	FORBS
FERN1	Ferns	FERNS
GRASS1	Graminoid including sedges and rushes	GRASS
AAGG1	Annual grasses	AAGGS
PPGG1	Perennial grasses	---

If another species of the same life-form can not be identified, it is labeled with the life-form followed by the number 2 (SHRUB2, FORB2, etc.). Up to five unknowns of each life-form may be recorded.

A generic record by plant form and layer is entered when a group of forb species (forb or fern) covers 3 or more percent on a vegetation plot but, as individual species, do not. Example: 6 species of forbs are present within a layer; one species covers 10 percent, and the other 5 species each cover 2 percent. Two records are entered: one record for the species of 10 percent, and a second generic FORBS record for the other 5 species which collectively cover 10 percent.

A generic record by plant form and layer is entered when a number of individual species of the same plant form and layer on a vegetation plot can not be identified by species but collectively meet minimum percent cover requirements.

On a remeasured vegetation profile plot, it is not necessary to enter an Oc4 species if the printed/downloaded Oc3 species is correct. Oc4 layer, and subplot percent cover are entered on the same line.

- **If an Oc3 species needs to be changed:** record the updated species in the "OC4 SPC" column; never delete the downloaded/printed Oc3 species code.
- **Splitting/Lumping species:** If two or more species were lumped into one generic record at Oc3 and can be separated by species at Oc4, add a new record for each species. On the new records, complete by subplot the Oc3 as well as the Oc4 percent cover, and layer. For these new records, the sum of their Oc3 percent covers by subplot should be equal to or less than the Oc3 percent covers recorded at Oc3 on the generic record. If some of the species grouped into one record at Oc3 still can not be identified, adjust the Oc3 subplot percent cover on the generic record to include only these species and code layer and Oc4 subplot percent cover collectively for this group.

If all species grouped at Oc3 can be identified and assigned separate records, record "00"s in the Oc4 column for Oc4 subplot percent covers on the old generic group record. Or, in the Oc4 column, record the percentages for each "split-out" species record, and record the remaining Oc4 percentages on the old generic record for those species that can not be identified individually.

- **Misidentified species:** If the species was misidentified at Oc3, record the correct species in the Oc4 species column. Oc4 data are entered on the same line as the Oc3 data. Do not update the Oc3 code.
- **Missed species:** If a species was obviously missed at Oc3, add a new line for it. Set Oc3 percent cover equal to Oc4 percent cover for a missed species.
- **New Species:** If a tree, shrub, or perennial grass species was not recorded at Oc3, but is now present, record a new record. Set Oc3 percent cover by vegetation plot to "00". If a forb or annual grass species was not recorded at Oc3, but is now present with at least 3 percent cover, record a new record, setting Oc3 percent cover by vegetation plot to "00" for these "ingrowth" species.

Is it a tree or is it a shrub?

Tally the following species as trees if they are, or will become, trees. A tree is defined as a woody plant that commonly has a perennial stem that is ≥ 7.5 cm. d.b.h. at maturity and a total height at maturity of ≥ 4 meters:

Common Name	Genus	Species	NRCS Abbreviation	Code
Cherry and Plum	Prunus	spp.	PRUNU, OR PREM, PRVI	760
Willow	Salix	spp.	SALIX	920
Pacific Dogwood	Cornus	nuttalli	CONU4	492
Cascara buckthorn	Frangula	purshiana	FRPU7	999
Curleaf mountain mahogany	Cercocarpus	ledifolius	CELE3	475

Although the following species occasionally attain tree size, they are always considered shrubs and are not tallied as trees:

Common name	Genus	Species	Exceptions
Serviceberry	Amelanchier	spp.	
Ceanothus	Ceanothus	spp.	
Mountain mahogany	Cercocarpus	spp.	Cercocarpus ledifolius
Bog birch	Betula	glandulosa	
Red or water birch	Betula	occidentalis	
Redbud	Cercis	occidentalis	
Bush chinquapin	Castanopsis	spp.	
Silktassel tree	Garryana	spp.	
Ocean spray	Holodiscus	discolor	
Rhododendron	Rhododendron	spp.	
Hazel	Corylus	spp.	
Poison-oak	Toxicodendron	spp.	
Manzanita	Arctostaphylos	spp.	
Buckthorn	Frangula	spp.	Frangula purshiana
Vine maple	Acer	circinatum	
Mountain maple	Acer	glabrum douglasii	
Elderberry	Sambucus	spp.	
Douglas maple	Acer	glabrum douglasii	
Indian plum	Osmaronia	cerasiformis	
Ninebark	Physocarpus	spp.	
Mountain ash	Sorbus	spp.	
Mockorange	Philadelphus	spp.	
Thinleaf alder	Alnus	tenufolia	
Creek and redstem dogwood	Cornus	spp.	Cornus nuttalli
Sitka alder	Alnus	sinuata	
Hawthorne	Crataegus	spp.	
Arrowwood	Viburnum	spp.	

2. Canopy layer

Record a 1-digit canopy layer code for each line entry. Downloaded/printed Oc3 records include the Oc3 layer entries. The code indicates the canopy layer by plant form to which a recorded species is assigned at Oc4. Canopy layer heights are assigned not by individual vegetation plot, but across the entire evaluated areas on all vegetation profile plots on a field plot (see page 86). A species can be in more than one layer by repeating the species code on an additional line.

3. Vegetation plot percent cover

Record a 2-digit code for percent cover on each vegetation plot. Record percent cover to the nearest 5 percent for trees, shrubs, forbs and grasses with a percent cover equal or greater than 3 percent. Code a "99" if the species covers the entire layer. A plant's stem can be outside evaluated area, but its crown may partly within the area and included as part of percent cover for the species.

Record Oc4 percent cover as "01" for trees, shrubs, and perennial grasses present on a vegetation plot with a percent cover less than 3 percent. For forbs and annual grasses only, if Oc3 vegetation plot percent cover on a downloaded record is greater than 0, and Oc4 vegetation plot percent cover is still greater than 0 but less than 3 percent, enter Oc4 vegetation plot percent cover as a "01"; otherwise, record the Oc4 vegetation plot percent cover as "00" for forb species with less than 3 percent cover at Oc4.

General rules: For each species record, estimate percent cover as the portion of the fixed-radius plot that would be obscured by all plants of the species if viewed from directly above the fixed-radius plot. In estimating cover, include the entire area within the general outline of a plant; ignore minor gaps between branches, and holes in the center of the plant. Because of overlap, the sum of individual species within any one canopy layer can be greater than 100 percent.

Base the percent cover estimate for forbs and grasses on the current years' growth. Include both living and dead material from the current year.

Record the percent cover estimate made at the time of the Oc4 visit. Do not adjust the percent for the time of year during which the visit was made (ie. the plants are immature and small because the plot is being completed early in the growing season).

20-percent cover means 20 percent of that part of the fixed-radius plot which is being evaluated; remember that evaluated area is less than the area of the entire 2.41 or 2.96 or 16.95-meter fixed-radius plot whenever more than one condition classes is present on the fixed-radius plot. Include the cover, that otherwise qualifies, of seedlings in a clump.

Oc3 and Oc4 percent cover of shrubs, forbs and grass on reevaluated vegetation plots: For each shrub, forb and grass species recorded at Oc3, Oc3 vegetation plot percent cover has been printed/downloaded. Use this downloaded percent as a guide. Record the percent cover estimate made during the Oc4 visit.

4. Stage of development for shrubs

For each shrub record with an Oc4 percentage of cover greater than 0 on one or more vegetation plots, enter the code below that best describes the shrub's stage of development within evaluated area across all vegetation profile plots on a plot.

Code	Shrub Stage of Development
1	Immature, no dead material (stems and branches) associated with the shrub record.
2	Mature, 1-24 percent dead material associated with the shrub record.
3	Over-mature, 25 percent or more dead material associated with shrub record.

C. Vegetation profile plot - total cover and layers

1. Percent cover of "all shrubs", "all forbs" and "all grass"

Record the total percent of cover of **all shrubs**, **all forbs**, and **all grass** within evaluated area across each vegetation profile plot present on the field plot. Record percent cover to the nearest 5 percent using a 2-digit code. Estimate percent cover as the portion of the fixed-radius vegetation plot within the condition class being evaluated that would be obscured by all shrub species/all forb species if viewed from directly above. Record total crown closure as "99". If "all shrubs", "all forbs" or "all grass" is greater than 0 but less than 3 percent cover, enter "01".

Total percent cover for a plant group (shrubs, forbs or grass) cannot exceed 100 percent. Total percent cover for a plant group cannot exceed the sum of percent cover recorded for all individual species (in both layers) of the plant group. However, total percent cover for a plant group can be, and often is, less than the sum of cover for all individual species within the group. This happens because of overlap between layers or when several species with 3-percent cover are coded individually as 5-percent (or more) cover.

2. Summary of canopy layer heights

Canopy layer heights are assigned to each plant group. This is done not by individual vegetation plot, but across the entire evaluated area on all of the vegetation profile plots on a field plot.

There can be 2 canopy layers for each plant group (tree seedlings, shrubs, forbs, and grass) on 2.41 and 2.96 meter fixed-radius vegetation plots. On 16.95-meter fixed-radius plots, there can be 3 canopy layers for trees and 2 canopy layers each for shrubs, forbs and grass. Record height of a canopy layer as a 3-digit code to the nearest decimeter for each layer within each plant group. Layer 1 is the taller layer within each plant group, and layer 2, the shorter layer. For instance, layer 1 height for shrubs would be the average height of the taller shrubs across the forest condition classes sampled for vegetation profile, and layer 2 height for shrubs would be the average height of shorter shrubs across the forest condition classes sampled for vegetation profile. If there is only one layer in the plant group, record the height in layer 1.

As work progresses on 2.41 or 2.96 meter vegetation plots, adjust the heights of the layers to better represent average layer heights across all the evaluated area on all of the subplots.

Determine if there are one or more layers for a plant group sampled across the plot area.

Height guidelines for recognizing as separate layers are:

- **Grass** canopy layers must differ by at least 5 decimeters.
- **Forb** canopy layers must differ by at least 5 decimeters.
- **Shrub** canopy layers must differ by at least 1 meter.
- **Tree seedling** layers must differ by at least 1 meter.
- **Tree** layers on 16.95-meter vegetation profile subplots must differ by at least 5 meters across these 16.95-meter plots.

3. Percent Bare Soil

Record the percent of the evaluated area that is covered by bare soil. Bare soil is mineral and decomposed organic material that, viewed from above, is not over-topped by grass, forbs, shrubs, seedlings or saplings. It is also not covered by duff, litter, cowpies, woody debris, moss or other material. Sand, stones and bedrock are not considered bare soil. Record percent bare soil to the nearest 5 percent using a 2-digit code. If the vegetation plot is entirely bare soil, record as "99". Record "01" for bare soil greater than 0 but less than 3 percent. This data is used to help make estimates of erosion, range condition and disturbance. It therefore includes only areas of bare soil having no cover at all, or only the cover of crowns on trees ≥ 12.5 cm d.b.h.

4. Percent Total Vegetation Cover

Record the percent of the evaluated area that is covered by any of the components measured on the vegetation profile plot (tree seedlings, shrubs, forbs and grass). Estimate percent cover as the portion of the fixed-radius vegetation plot within the condition class being evaluated that would be obscured by seedling/shrub/forb/grass species if viewed from directly above. Ignore crown overlap. Record total vegetation cover as "99". Record "01" for total vegetation cover greater than 0 but less than 3 percent. Percent total vegetation cover and percent bare soil combined can not exceed 100 percent, and will likely be less due to the way each is defined and the inclusion of different elements.

D. Seedling Count

Seedling counts by species are recorded on the **2.41 or 2.96** meter fixed-radius plot at each subplot center on the standard layout. Count seedlings across all forest condition classes mapped within the 2.41 or 2.96 meter fixed-radius plot; do not count by condition class.

Count a seedling if it is at least 15 cm tall on the **2.41 or 2.96** meter fixed-radius plot. To be counted, a seedling's bole center at the ground must be within **2.41 or 2.96** meters horizontal distance of subplot center. Count all live seedlings regardless of vigor, damage, or closeness to other trees, but count only one seedling from a clump; a clump is 3 or more live stems that sprouted from a common root base (including stumps). Note: The selection criteria for seedling count differs from the selection criteria for

seedlings on the trackable tree tally (page 96). Seedling counts provide information on the distribution and abundance of tree species. Pacific yew counts are of special interest because yew contains taxol in its bark, needles and roots and stems; taxol, proven effective in suppressing several cancers, is obtained only from yew species.

1. Pacific Yew seedling count

On the **2.41 or 2.96** meter fixed-radius plot, record the number of all Pacific Yew sprouts present (Code 230) and the number of all Pacific Yew seedlings present (Code 231) if any portion of the subplot is forest land. Sprouts are asexual vegetative reproduction, and seedlings are sexual reproduction. Sprouts grow from live stumps or stems; seedlings establish and grow from soil or from dead, decaying stems or plant matter.

2. Seedling count - species other than Pacific Yew

Record the number of seedlings of each tree species present on the **2.41 or 2.96** meter fixed-radius plot. Record up to 5 seedlings of each species present. If more than 5 seedlings are present for a species, record "6".

E. Collection and identification of unknown plants

To improve the quality of vegetation profile data, a formal procedure is followed to identify more of the unknown plant species that are tallied.

Each crew (truck) will be supplied with a three-ring binder containing sealable plastic bags for the collection of unidentified specimens. The binders provide some degree of protection to collected plants, and help to prevent their loss. Each bag has a label that should be filled out when a specimen is collected; the label identifies the plot and subplot from which the bagged specimen was collected.

While on the plot, the crew should not spend an inordinate amount of time trying to identify an unknown plant. If the plant can be keyed out quickly using a plant guide, identification should be attempted. If the crew is confident the plot can be completed in one day, they can spend more time trying to identify unknown plants while on the plot. In most cases, though, it will be more effective to collect unknown plants for later identification. If the plant can not be identified and qualifies for tally as a generic life-form record (shrub, forb, fern, grass), enter the record.

Gather as much of the complete plant as is feasible. Include roots, flowers, and seed-heads if possible. Write a brief description of the site from which the plant was collected, the plant community of which it was a member, and any other information which may assist in identification.

Once back at the motel, try to identify the collected specimens the same day that the plot was visited. Use whatever plant guides are available and the Polyclave program which is installed on the laptop computer. Other field team members who might be familiar with the species and/or are good at plant identification may be consulted. Twenty minutes is the recommended maximum amount of time that should be spent on one plant. If the specimen can not be identified, contact the crew coordinator. If the same plant is collected several times and identification attempts are unsuccessful, the crew coordinator may contact a botanist for identification.

If no attempt can be made to key out a plant the same day it is collected, the specimen should be placed in a plant press (one is in each vehicle). Do not leave the specimen in the plastic bag; specimens left bagged may mildew and mold.

If a plant is successfully identified, the vegetation profile data for that plot should be updated before transferring the plot data to the laptop computer.

VIII. TRACKABLE TREE AND SNAG SELECTION

TABLE OF CONTENTS

VIII. TRACKABLE TREE AND SNAG SELECTION	91
A. Introduction.....	91
B. Determining if a tree <12.5 cm. d.b.h. is selected on the 2.41/2.96 meter fixed-radius plot	91
C. Determining if a tree or snag \geq 12.5 cm. d.b.h. is sampled using variable-radius sampling	91
D. Trackable tree and snag selection.....	93
E. Seedling requirements	96

VIII. TRACKABLE TREE AND SNAG SELECTION

A. Introduction

Large trees and snags (≥ 12.5 cm. d.b.h.) are sampled using variable-radius sampling. The basal area factor used is either 30 square feet per acre (BAF 30), or 20 square feet per acre (BAF 20) depending on the plot. Trees and snags whose bole center at d.b.h. is more than 16.95 meters horizontal distance from subplot center are not sampled even if within their limiting distance ("in" with the BAF 30 or BAF 20 prism; see page 178). This is done to avoid selecting trees that are too far from subplot center to influence growing conditions at subplot center and to sample large trees efficiently.

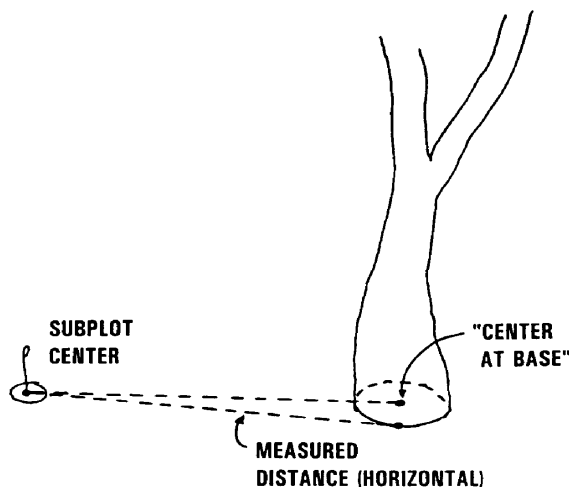
Seedlings (< 2.5 cm. d.b.h. and ≥ 15 cm. tall) and saplings (trees 2.5 to 12.4 cm. d.b.h.) are sampled more efficiently using a small fixed-radius plot. The plot's fixed-radius, either 2.41 or 2.96 meters, is the limiting distance for a tree with a d.b.h. of 12.5 cm. when trees are selected using variable-radius sampling with a BAF of 30 or 20.

On all plots measured in the Blue Mountains unit, and on a majority of the plots in the Central unit, a BAF 30 prism is used to sample large trees and snags, and a 2.41 meter fixed-radius plot is used to sample seedlings and saplings. Some plots in the Central unit with severe tree stocking limitations are measured using a BAF 20 prism with a 2.96 meter fixed-radius plot. All new 5-point variable-radius plots will be established using a BAF 30 prism with a 2.41 meter fixed-radius plot.

The BAF used for each plot is on the Oc3 data sheets, the downloaded plot sheets, and the tree tally section of the Husky program. A list of the 61 plots where a BAF 20 prism is used is found in Appendix 4 on page 183.

B. Determining if a tree < 12.5 cm. d.b.h. is selected on the 2.41/2.96 meter fixed-radius plot

Trees are selected only when their bole center at the ground is within 2.41/2.96 meters horizontal distance of subplot center (see figure below).



C. Determining if a tree or snag ≥ 12.5 cm. d.b.h. is sampled using variable-radius sampling

Limiting distance is the horizontal distance from subplot center to the bole center of a tree at d.b.h. that the tree must be within to be sampled. Limiting distances vary by diameter; as diameter increases;

limiting distance increases. Limiting distances by diameter are listed for variable-radius sampling with basal area factors of 30 and 20 on page 178. The limiting distance for a tree may also be calculated using the following equation:

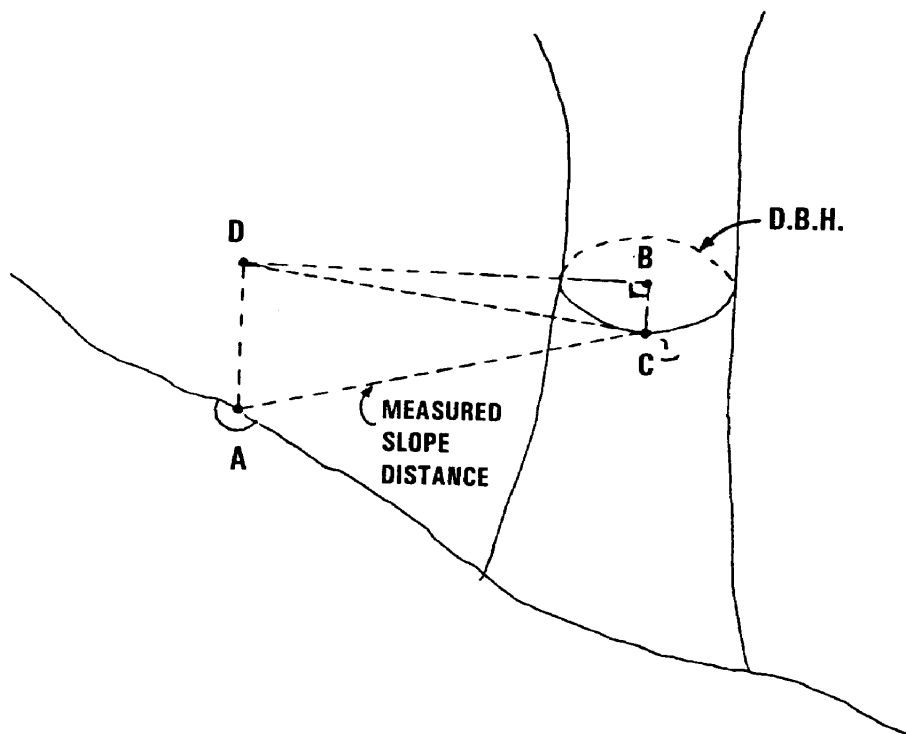
$$L = F \times \text{d.b.h.} \quad \text{where:}$$

L = limiting distance in meters;
F = **0.23329** for 20 BAF prism
F = **0.19046** for 30 BAF prism;
d.b.h. = the tree's diameter breast height in centimeters

Usually, it is clear, when using a prism, whether or not a tree or snag ≥ 12.5 cm. d.b.h. should be sampled; i.e., it is usually obvious if the tree or snag is within ("in") or beyond ('out') its limiting distance. However, some trees and snags are borderline: not clearly "in" or "out" when viewed through the prism.

Use the following method to check borderline trees and snags:

1. Drive a nail into the tree at breast height (point C), at a location that is perpendicular to the sample point
2. With a 30-meter tape, measure the slope distance from the nail to subplot center (point C to point A).
3. Using a clinometer, measure the slope along this line (sighting from point C to point A). Use the slope correction table in on page 177 to calculate the actual horizontal distance from C to A; this distance equals the distance from B to D.
4. Compare this calculated horizontal distance to the limiting distance (page 178) for the tree's d.b.h. If the actual distance is less than the limiting distance, the tree is "in." If the actual distance is greater than the limiting distance, the tree is "out."



D. Trackable tree and snag selection

If a condition class has a sample kind of 3, 5, 6, 7, 9, or 0 no trees or snags are selected or remeasured.
If a condition class has a sample kind of 1, one of the following 3 alternatives applies:

1. If the condition class has a forest ground land class of 20, 41, 43, 44, 46, 49 or 50, and the condition class does not require the remeasurement or reconstruction of trees and snags sampled at Oc3 (condition class is ≥ 2 on a ##, C or N subplot, or condition class is 1 on an N subplot), sample the following trees and snags that are within the condition class:
 - a) Tally all trees live and ≥ 12.5 cm. d.b.h. and all snags that are ≥ 12.5 cm. d.b.h., ≥ 2 meters tall, and lean less than 45 degrees that are "in" using a BAF 30/20 prism. Tally a tree or snag only if its bole center at d.b.h., is within 16.95-meters horizontal distance of the subplot center. Assign a tree history of 2 to the live trees and a tree history of 7 to the snags.
 - b) Tally live trees 2.5 to 12.4 cm. d.b.h. that are within the 2.41/2.96-meter fixed-radius plot. Assign a tree history of 2.
 - c) Tally live seedlings (trees < 2.5 cm. d.b.h. and ≥ 15 cm. tall) present within the 2.41/2.96-meter fixed-radius plot if the combined tally of live trees ≥ 2.5 cm. d.b.h. present in the condition class on the subplot is less than 4. Tally seedlings, if present, until the total tally of live trees is 4 in the condition class on the subplot. Assign these seedlings tree histories of 2. Tally a seedling only if it meets the requirements specified in the section "Seedling requirements" on page 96.
2. If the condition class has a forest ground land class of 20 or 49, and the condition class requires remeasurement of trees and snags sampled at Oc3 (condition class is 1 on a ##, R or X subplot), do following steps in the condition class:
 - a) Account for each downloaded tree in condition class 1 that was tallied live and 2.5-12.4 cm. d.b.h. at Oc3.

If the tree is still live, the tree keeps its tree history is 1.

If the tree has been culturally-killed or harvested, assign a tree history of 3. If still standing and ≥ 12.5 cm. d.b.h. and ≥ 2 meters tall and leaning less than 45 degrees from vertical, also enter the tree as a snag with a tree history of 7 on a new line that is assigned the same line number as the culturally-killed tree record. Snag use is 10 or 11. See page 99 for the definitions of "culturally-killed tree" and "harvested tree."

If the tree died of natural causes, assign a tree history of 5. If still standing and ≥ 12.5 cm. d.b.h. and ≥ 2 meters tall and leaning less than 45 degrees from vertical, also enter the tree as a snag with a tree history of 7 on a new line that is assigned the same line number as the mortality tree record. Snag use is 10 or 11. See page 99 for the definition of "dead (mortality) tree."
 - b) Tally, if within the 2.41/2.96-meter fixed-radius plot, any live tree ≥ 2.5 cm. d.b.h. in condition class 1 that was not tallied at Oc3. The tree at Oc3 was either not yet alive, a seedling, or a missed tree. (A missed tree is a live tree which should have been selected at Oc3 but was not).

If the tree was not alive or was a seedling at Oc3, assign a tree history of 4.

If the tree was missed at Oc3, assign a tree history of 6.
 - c) Account for each downloaded tree in condition class 1 that was tallied live and ≥ 12.5 cm. d.b.h. at Oc3.

If the tree is still live, the tree keeps its tree history of 1.

If culturally-killed, assign the tree a tree history of 3. If still standing and ≥ 12.5 cm. d.b.h. and ≥ 2 meters tall and leaning less than 45 degrees from vertical, also enter the tree as a snag with a tree history of 7 on a new line that is assigned the same line number as the culturally-killed tree record. See page 99 for the definition of a culturally-killed tree.

If dead of natural causes, assign the tree a tree history of 5. If still standing and ≥ 12.5 cm. d.b.h., and ≥ 2 meters tall, and leaning less than 45 degrees from vertical, also enter the tree as a snag with a tree history of 7 on a new line that is assigned the same line number as the dead tree record. See page 99 for the definition of a dead (mortality) tree.

If harvested, assign the tree a tree history of 8. See page 99 for the definition of a harvested tree.

If the horizontal distance from the subplot center to the bole center of the tree at d.b.h. is greater than 16.95 meters, assign a tree history of "X" and include an explanation in the tree remarks section.

- d) Tally any live tree ≥ 12.5 cm. d.b.h. in condition class 1 that was not tallied at Oc3, but is "in" using a BAF 30/20 prism and is, at bole center at d.b.h., within 16.95-meters horizontal distance of the subplot center.

Assign a tree history of 2 if the tree was ≥ 2.5 cm. d.b.h. at Oc3 but was too small to be selected at Oc3.

Assign a tree history of 4 if the tree was < 2.5 cm. d.b.h. at Oc3 and is within the 2.41/2.96-meter fixed-radius plot.

Assign a tree history of 6 if the tree was ≥ 12.5 cm. d.b.h. and "in" at Oc3 but missed at Oc3.

- e) Tally live seedlings (trees < 2.5 cm. d.b.h. and ≥ 15 cm. tall) present within the 2.41/2.96-meter fixed-radius plot if the combined tally of live trees ≥ 2.5 cm. d.b.h. present in condition class 1 on the subplot is less than 4. Tally seedlings, if present, until the total tally of live trees is 4 in condition class 1 on the subplot. Assign these seedlings tree histories of 4. Tally a seedling only if it meets the requirements specified in the section "Seedling requirements" on page 96.
- f) Account for each downloaded snag in condition class 1 that was tallied as a snag at Oc3. An Oc3 snag is either 1) a snag that is still ≥ 12.5 cm. d.b.h., and ≥ 2 meters tall, and leans less than 45 degrees from vertical, 2) a snag that is still present but no longer meets one or more of these minimum specifications, or 3) a snag now down or gone. Tree history is a 7 in each of these cases but data requirements differ by case; refer to the appropriate tally guide record. A snag tallied at Oc3 that is still ≥ 12.5 cm. d.b.h. but no longer "in" with a 30/20 BAF prism at Oc4 is still "in."
- g) Tally any snag in condition class 1 that was missed but "in" with a 30/20 BAF prism at Oc3. To qualify, a snag has to have been a snag ≥ 12.5 cm. d.b.h., ≥ 2 meters tall at Oc3, and must meet these minimum diameter and height specifications at Oc4. Additionally at Oc4, the snag must lean less than 45 degrees from vertical, and must still be "in" with a BAF 30/20 prism and must be, at bole center at d.b.h., within 16.95-meters horizontal distance of the subplot center. Assign the snag a tree history of 7, set Oc3 d.b.h. equal to Oc4 d.b.h. and set Oc3 height equal to Oc4 height. The Husky assigns the snag record a new line number. At Oc3, only snags greater than 25.4 cm d.b.h. were tallied. Snags ≥ 12.5 cm d.b.h. and < 25.4 cm. d.b.h. not tallied at Oc3, but meeting the above criteria, are tallied at Oc4 as "missed" with a tree history of 7.
- h) Tally any snags in condition class 1 that have "grown in" since Oc3 and died. To qualify, the snag has to have been live at Oc3, but did not qualify for tally on the fixed or variable-radius plot (i.e. it was "out"). At Oc4 the snag must be "in" with a BAF 30/20 prism, ≥ 12.5 cm. d.b.h.,

≥ 2 meters tall, lean less than 45 degrees from vertical, and must be, at bole center at d.b.h., within 16.95-meters horizontal distance of the subplot center. Assign the snag a tree history of 7, leave Oc3 d.b.h. and Oc3 height blank. Snag use is 10 or 11. The Husky assigns the snag record a new line number. No mortality record is needed.

3. If the condition class has a forest ground land class of 20 or 49, and the condition class requires reconstruction of trees estimated to have been alive at Oc3 (condition class is 1 on a C subplot), tally the following trees and snags in the condition class:

- a) Tally all trees live and ≥ 12.5 cm. d.b.h. that are "in" using a BAF 30/20 prism from subplot center and are, at bole center at d.b.h., within 16.95 meters horizontal distance of the subplot center.

Assign a tree history of 4 to live trees if < 2.5 cm. d.b.h. at Oc3 and within the 2.41/2.96-meter fixed-radius plot. Otherwise, assign live trees a tree history of 2.

- b) Tally all live trees 2.5 to 12.4 cm. d.b.h. within the 2.41/2.96-meter fixed-radius plot.

Assign a tree history of 2 if ≥ 2.5 cm. d.b.h. at Oc3.

Assign a tree history of 4 if < 2.5 cm. d.b.h. at Oc3.

- c) Tally live seedlings (trees < 2.5 cm. d.b.h. and ≥ 15 cm. tall) present within the 2.41/2.96-meter fixed-radius plot if the combined tally of live trees ≥ 2.5 cm. d.b.h. present in the condition class on the subplot is less than 4. Tally seedlings, if present, until the total tally of live trees is 4 in the condition class on the subplot. Assign these seedlings tree histories of 4. Tally a seedling only if it meets the requirements specified in the section "Seedling requirements" on page 96.

- d) Tally any tree within the 2.41/2.96-meter fixed-radius plot that 1) was live and had, by your estimate, a d.b.h. of 2.5 to 12.5 cm. at Oc3, and 2) is still < 12.5 cm. d.b.h. and is now culturally-killed, dead of natural causes, or harvested. If culturally-killed, the tree is assigned a tree history of 3. If dead of natural causes, the tree is assigned a tree history of 5.

- e) Tally any tree ≥ 12.5 cm. d.b.h. that is culturally-killed, dead of natural causes, or harvested if it meets the following criteria:

- (a) The tree is estimated to have been live and ≥ 12.5 cm. d.b.h. at Oc3,
- (b) The tree (or stump) is "in" using a BAF 30/20 prism, and
- (c) The tree is, at bole center at d.b.h. (or the top of stump), within 16.95-meters horizontal distance of the subplot center.

If culturally-killed, the tree is assigned a tree history of 3.

If dead of natural causes, the tree is assigned a tree history of 5.

If harvested, the tree is assigned a tree history of 8.

If still standing, and ≥ 12.5 cm. d.b.h. and ≥ 2 meters tall and leaning less than 45 degrees from vertical, the tree also is tallied as a snag on a separate line with the same line number as assigned to its record as a culturally-killed or dead tree. Tree history is 7.

The terms "culturally-killed tree", "dead (mortality) tree", and "harvested tree" are defined on page 99.

- (f) Tally any snag not recorded in step e. that is ≥ 12.5 cm. d.b.h., and ≥ 2 meter tall and leans less than 45 degrees from vertical. To be tallied, the snag must be "in" using a BAF 30/20 prism and must be, at bole center at d.b.h., within 16.95-meters horizontal distance of the subplot center. (A snag tallied in this step (f.) was not also entered as a tree record for a culturally killed or dead tree). Tree history is 7.

E. Seedling requirements

A seedling is: a live tree less than 2.5 cm. d.b.h., at least 15 cm. in height, and established in mineral soil. (The requirements that follow differ from the requirements for "Seedling Count" on page 87).

Tally a seedling only if it meets the following requirements:

1. Select a seedling only if its bole center at the ground is within 2.41/2.96 meters (horizontal distance) of subplot center.
2. Select a seedling only if it is expected to live at least 10 more years.
3. Do not tally a suppressed seedling.
4. If a seedling is dominant or codominant and less than 1.37 meters tall, it must be at least 0.5 meters from any other tally tree. An intermediate or overtopped seedling of any height must be at least 0.5 meters from any other tally tree. Ignore residual overstory trees ≥ 12.5 cm. d.b.h. when evaluating the crown class of an additional stocking seedling.
5. If a conifer, select a seedling only if it currently is not overtopped and shaded by another conifer and will not be overtopped and shaded by another conifer before reaching 22.5 cm. d.b.h. This includes overtopping by other conifers that are within or outside the 2.41/2.96-meter fixed-radius plot. Ignore overtopping by conifers ≥ 22.5 cm. d.b.h. and 50 years old (b.h. age) if the conifer seedling is of a shade tolerant species (true firs except noble fir, hemlocks, spruces, and cedars except incense cedar).

Whether or not a conifer is overtopped is estimated by using the "inverted cone" method. This method projects two straight lines along the branch tips of a tree's cone-shaped crown upward from their intersection at the tree's tip to create an imaginary cone, in the growing space above the tree as shown in the figure below. If one-third or more of the imaginary cone is occupied by the live crown(s) of other conifer(s), the tree is considered overtopped. If less than one-third of the imaginary cone is occupied, the tree is considered "free-to-grow".

6. Only one hardwood seedling in a hardwood clump can be selected. If more than one seedling in a clump is a candidate for being tallied, select the most dominant seedling candidate. Do not tally seedling-sized suckers that have sprouted from the base of a live, unsuppressed hardwood stem that is ≥ 12.5 cm. d.b.h. A clump is defined as 3 or more live stems that sprouted from a common root system which had originated as part of a earlier tree whose above-ground bole was cut or is no longer alive. Select trees by the following species priority:
7. Conifer species except for Pacific yew, incense cedar, and Port Orford cedar.
8. Incense cedar and Port Orford cedar.
9. Red alder and black cottonwood.
10. All other hardwood species except for dogwood, cherries, willows, hollies, or species coded 999.
11. Do not tally Pacific yew, dogwood, cherries, willows, hollies, or species coded 999. Within each level of species priority, select seedlings in order of dominance and vigor.

IX. TRACKABLE TREE AND SNAG DATA

TABLE OF CONTENTS

IX. TRACKABLE TREE AND SNAG DATA.....	99
Data recording	99
Item 1--Line number (LINE #):	99
Item 2--Subplot number (Sub Pl):	99
Items 3 and 4--Condition class (Cc) and Tree history (TH)	99
Item 5--Species (SPC).....	101
Item 6--Azimuth (AZM)	102
Item 7--Distance (DIST).....	102
Item 8--Tree number (TRN)	102
Item 9--Oc3 to 4 Increment (INC)	102
Item 10--Oc3 d.b.h. (Oc3 DBH)	104
Item 9B--Oc3.5 to 4 Increment.....	104
Item 11--Oc4 d.b.h. (OC4 DBH).....	105
Item 12--Oc3 height (Oc3 HT)	109
Item 13--Oc4 height (OC4 HT).....	109
Item 14--Breast-height age (BH AGE).....	111
Item 15--Oc3 crown ratio (C)	112
Item 16--Oc4 crown ratio (R)	112
Item 17--Oc3 crown class (C)	113
Item 18--Oc4 crown class (C)	113
Item 19--Mistletoe (M)	114
Item 20--Hardwood clump (CL).....	115
Item 21--Cull other/hardwood form class (CO)	116
Item 22--Cull rot (CR)	118
Items 23 through 28--Damaging agent/severity (Agt, S).....	119
Item 25--(Agent 2) Cause of death/Wildlife use or Reason for disappearance/Harvest use ...	124
Item 24--Oc3 snag decay class.....	125
Item 26--Oc4 snag decay class.....	125
Tree record comments.....	126

IX. TRACKABLE TREE AND SNAG DATA

Data recording

Record one line on the Husky data recorder for each tree sampled. Required data items for these trees vary by subplot, condition class and tree history. Use this section and the tally guides inside the front cover of the manual to determine which items to complete for a particular kind of tree. Stocking plot data items are not covered in this section (see page 155).

If a forest land condition class occupies part or all of a subplot's 16.95-meter fixed-radius plot, and there are no tree records for the condition class on the subplot except those with a tree history of 7 or 9, record one line with the subplot number, the condition class number, a tree history of "0" and enter "NO TALLY" in remarks. If all forest condition classes within subplot on the standard layout are "NO TALLY", two additional records are required to reference subplot center; these reference records can represent sound stumps or snags, but live trees are preferable (see pages 39 and 42 for instructions on referencing subplots).

If both forest and one or more nonforest condition classes are mapped on a subplot's 16.95-meter fixed-radius plot, enter one line for each nonforest condition class; for each of these records, enter the subplot number, condition class number, and a tree history of 0, and enter "NO TALLY" in remarks.

If the 16.95-meter fixed-radius plot on a subplot is entirely nonforest land, enter one line for each mapped nonforest condition class; for each record, enter the subplot number, condition class number, and a tree history of 0, and enter "NO TALLY" in remarks. No references are needed when a subplot is entirely nonforest land.

Item 1--Line number (LINE #):

Printed/downloaded for Oc3 trees, snags, reference-only trees, and "no tally" records. New records are assigned a line number by the Husky. In either case, the line number should not be changed by the field crew.

A reference-only tree (tree history 9) recorded at Oc3 can be assigned a new line number so that the line can be used if the tree is now a sampled tree. If a mortality tree (tree history 5) qualifies as a snag (tree history 7) at Oc4, the new snag record uses the same line number assigned to the mortality tree record.

Item 2--Subplot number (Sub Pl):

A 2-character code recorded for all trees on all subplots. The second digit is the Oc4 subplot number. For the first digit, refer to "Plot layout--sections D and E starting on page 20).

Items 3 and 4--Condition class (Cc) and Tree history (TH)

1-digit codes needed for all tally trees, snags and reference only trees. The first, condition class is coded to indicate the condition class that the tree is located in. The second, tree history indicates the current status of a tree record. Apply the following schedule for these variables:

Condition class and tree history codes are displayed in the tabulation on the following page:

Condition Class Code	Tree History Code	Tree History Status	Tree History Description
1	1	Remeasured	Tree tallied live at Oc3 and still live at Oc4.
1	2	New: reconstructed	Live tree in condition class 1 tallied for the first time at Oc4.
≥2	2	New: not reconstructed	Live tree in condition class 2-5 at Oc4.
1	3	Culturally-killed	Tree tallied or reconstructed as live at Oc3 but now culturally-killed: killed by direct human activity and not utilized. It can be a standing, downed, or felled tree. Include trees killed by logging injury but not felled. A tree is culturally-killed only if it shows no sign of life or is partially uprooted, live, and leans ≥45 degrees. Not tallied on N# subplots.
1	4	Oc4 ingrowth	Tree tallied live at Oc4 on 2.41/2.96-meter fixed-radius plot which was not alive at Oc3 or was <2.5 cm at Oc3. Not coded on N# subplots.
1	5	Mortality	Tree tallied or reconstructed as live at Oc3 but now dead. Death was natural and not due to human activity. A tree is dead only if it shows no sign of life or is partially uprooted, live, and leans ≥45 degrees. If the dead tree qualifies as a snag, record snag info on a separate line with the same 5-digit line # and a TH 7. Not tallied on N# subplots.
1	6	Missed tree	Live tree which should have been tallied at Oc3. Must be on a ##, R or X subplot in condition class 1 at Oc4. Requires reconstruction. Not tallied on N# subplots.
≥1	7	Snag	A standing dead tree which is ≥12.5 cm d.b.h., ≥2 meters tall, and leans <45 degrees. Can be self-supported by its roots or supported by another tree or snag. On remeasured subplots: leave as TH 7 a snag tallied at Oc3 but gone at Oc4; leave as TH 7 a snag tallied at Oc3 but <12.5 cm d.b.h. or <2 meters tall, or leans ≥45 degrees at Oc4. Tally snags on remeasured subplots which have 'grown in' since Oc3 and died, and any snags missed at Oc3. Snags tallied at Oc3 that are still ≥12.5 cm d.b.h. and ≥2 m. tall, and lean <45 degrees but are "out" at Oc4 with the prism are still snags at Oc4. A tree showing any sign of life does not qualify as a snag.
1	8	Harvested	A tree tallied or reconstructed as live and ≥12.5 cm d.b.h. at Oc3 but now harvested for industrial supply, firewood, local use or incidental reasons. Not tallied on N# subplots.
≥1	9	Reference only	A tree, snag or stump which is a reference that is not a trackable tree. Includes TH 3, 5, and 8 in condition class 1 that are used as a reference; such references must be entered as a new reference tree record. Same for TH 7 in condition class 1 that no longer qualify as snags.
≥1	0	No live tally	Enter a line with TH=0 for each condition class without live tally trees (TH 1, 2, 4, 6) on a subplot. Includes subplots that are entirely nonforest.
≥1	X	Delete record	"X" deletes a record inadvertently entered or no longer needed.

Item 5--Species (SPC)

A 3-digit code indicating tree species. The code is printed/downloaded for trees tallied at Oc3. Change the printed/downloaded code if the species was misidentified at Oc3 and note "species misidentified" in remarks column. Record for all new snags, live or reconstructed trees, and reference only trees.

Code	Species	Code	Common Name
011	Pacific silver fir (ABAM)	231	Pacific yew (TABR2)
015	White fir (ABCO)	242	Western redcedar (THPL)
017	Grand fir (ABGR)	263	Western hemlock (TSHE)
019	Subalpine fir (ABLAL)	264	Mountain hemlock (TSME)
021	Shasta red fir (ABSH)	312	Bigleaf maple (ACMA3)
022	Noble fir (ABPR)	351	Red alder (ALRU2)
041	Port-Orford-cedar (CHLA)	352	White alder (ALRH2)
042	Alaska yellow cedar (CHNO)	361	Pacific madrone (ARME)
064	Western juniper (JUOC)	431	Giant chinkapin (CACH6)
081	Incense cedar (CADE27)	492	Pacific dogwood (CONU4)
092	Brewer spruce (PIBR)	542	Oregon ash (FRLA)
093	Engelmann spruce (PIEN)	590	Holly spp. (ILEX)
098	Sitka spruce (PISI)	600	Walnut spp. (JUG)
101	Whitebark pine (PIAL)	631	Tanoak (LIDE3)
103	Knobcone pine (PIAT)	660	Apple spp. (MALUS)
108	Lodgepole pine (PICO)	746	Quaking aspen (POTR5)
116	Jeffrey pine (PIJE)	747	Black cottonwood (POBAT)
117	Sugar pine (PILA)		and hybrid populus spp.
119	Western white pine (PIMO3)	805	Canyon live oak (QUCH2)
122	Ponderosa pine (PIPO)	815	Oregon white oak (QUGA4)
202	Douglas-fir (PSME)	818	California black oak (QUKE)
211	Redwood (SESE3)	981	California laurel (UMCA)
212	Giant sequoia (SEGI2)	999	Other trees (identify in remarks) including FRPU7

Tally the following species as trees if they are, or will become, trees. A tree is defined as a woody plant that commonly has a perennial stem that is ≥ 7.5 cm. d.b.h. at maturity and a total height at maturity of ≥ 4 meters:

475	Curleaf mountain mahogany (<u>Cercocarpus ledifolius</u>)	(CELE3)
492	Pacific dogwood (<u>Cornus nuttalli</u>)	(CONU4)
760	Cherry and plum spp. (<u>Prunus spp.</u>)	(PRUNU, or PREM, PRVI)
920	Willow spp. (<u>Salix spp.</u>)	(SALIX)
999	Cascara buckthorn (<u>Frangula purshiana</u>)	(FRPU7)

Although the following species occasionally attain tree size, they are always considered shrubs and are not tallied as trees:

Serviceberry (<u>Amelanchier spp.</u>)	Ceanothus (<u>Ceanothus spp.</u>)
Mountain mahogany (<u>Cercocarpus spp.</u> except <u>Cercocarpus ledifolius</u>)	Red or water birch (<u>Betula occidentalis</u>)
Redbud (<u>Cercis occidentalis</u>)	Bog birch (<u>Betula glandulosa</u>)
Silktassel tree (<u>Garryana spp.</u>)	Bush chinquapin (<u>Castanopsis spp.</u>)
Rhododendron (<u>Rhododendron spp.</u>)	Ocean spray (<u>Holodiscus discolor</u>)
Poison-oak (<u>Toxicodendron spp.</u>)	Hazel (<u>Corylus spp.</u>)
Buckthorn (<u>Frangula spp.</u> except <u>Frangula purshiana</u>)	Manzanita (<u>Arctostaphylos spp.</u>)
Elderberry (<u>Sambucus spp.</u>)	Vine maple (<u>Acer circinatum</u>)
Indian plum (<u>Osmaronia cerasiformis</u>)	Mountain maple (<u>Acer glabrum douglasii</u>)
Mountain ash (<u>Sorbus spp.</u>)	Douglas maple (<u>Acer glabrum douglasii</u>)
Thinleaf alder (<u>Alnus tenuifolia</u>)	Ninebark (<u>Physocarpus spp.</u>)
Sitka alder (<u>Alnus sinuata</u>)	Mockorange (<u>Philadelphus spp.</u>)
Hawthorne (<u>Crataegus spp.</u>)	Creek and redstem dogwood (<u>Cornus spp.</u> except <u>Cornus nuttalli</u>)
	Arrowwood (<u>Viburnum spp.</u>)

Monumenting information

Tree azimuth, distance, and tree number are used to relocate subplots and the trees and snags tallied on subplots.

Item 6--Azimuth (AZM)

3-digit code describing the azimuth to the nearest degree, from subplot center to the tree or snag (specifically: ..to the tree number tag if present, or to the center of the base of tree or snag if not tagged). Printed/ downloaded on the trackable tree tally record for snags and for trees tallied live and ≥ 2.5 cm. d.b.h. at Oc3. Change the printed/downloaded azimuth if more than 4 degrees in error if the Oc3 tally is still a snag, live tally, or reference. Required on all new Oc4 snags, new Oc4 trees tallied live including seedlings, and new trees that are reference only. Also required on trees reconstructed at Oc4 that are culturally-killed, dead, or harvested. Use the magnetic declinations shown on page 55. Code a north azimuth as "360".

Item 7--Distance (DIST)

3-digit code indicating the slope distance in decimeters, from subplot center to the head of the nail that affixes the tree number tag or to the front of the tree at the base if not tagged with a number. Printed/downloaded on the trackable tree tally record for snags and for trees tallied live and ≥ 12.5 cm. d.b.h. at Oc3. Required on all new Oc4 snags, new Oc4 trees tallied live including seedlings, and new trees that are reference only. Also required on trees ≥ 12.5 cm. d.b.h. reconstructed at Oc4 that are culturally-killed, dead, or harvested.

Distance should be measured to the nearest decimeter on tally requiring a distance if within 8 meters slope distance of subplot center. Tally requiring distance that is more than 8 meters from subplot center can be estimated to the nearest meter. Distances on subplot references must be measured accurately to the nearest decimeter regardless of distance to subplot center. The last digit of an estimated distance should be recorded as "0".

Item 8--Tree number (TRN)

3-digit code used to identify sampled trees ≥ 12.5 cm. d.b.h. Tree numbers of 001-999 are valid codes. Printed/downloaded on the trackable tree tally record for trees sampled live and ≥ 12.5 cm. d.b.h. at Oc3; change the recorded code if you change the tree number tag on one of these trees. Some tree numbers were updated during the 1992 update inventory.

All trees live and 12.5 cm d.b.h. or larger sampled at Oc4 must be marked with an aluminum tree number tag and have the number recorded EXCEPT for trees that are references only. Trees reconstructed at Oc4 that are culturally-killed, dead, or harvested do not need a tree number. If a tag was installed at a previous inventory it may be left on the tree.

For trees requiring a tree number tag: Reuse the old tree number tag if serviceable or attach a new tag. Be sure the tag is nailed to the tree below stump height and faces subplot center. The nail should be driven in only as far as necessary to firmly anchor it in the wood. When replacing an old tag, discard it. If an old tag cannot be removed, pound it in until flush with the bark so it will be overgrown and not confused with the new tag. Trees tagged previously that are culturally-killed, dead or harvested do not need retagging or maintenance.

Do not use a tree number more than once on the same subplot Before leaving the vehicle, make sure the tree numbers previously assigned to downloaded trees are different than the numbers on the new tags you may use.

Item 9--Oc3 to 4 Increment (INC)

A 3-digit code recording bored radial increment inside the bark to the nearest millimeter for the period between Oc3 and 4.

Bored increment and reconstructed Oc3 d.b.h. is required for:

1. Conifers and red alders that are sampled live and ≥ 12.5 cm. d.b.h. for the first time at Oc4 and are in condition class 1 on a ##, R, X, or C subplot. Tree history is 2 or 4. Includes trees sampled live and ≥ 12.5 cm. d.b.h. on C subplots (reconstructed subplots in condition class 1).
2. Conifers and red alders that were live and "in" but not tallied at Oc3 (missed tree) and are live and cm. d.b.h. at Oc4 in condition class 1 on a ##, R or X subplot. Tree history is 6.
3. Conifers and red alders with a downloaded Oc3 d.b.h. that is greater than Oc4 d.b.h. or unreasonably smaller than Oc4 d.b.h. This applies only to trees:
 - a) sampled live at Oc3 and 4,
 - b) have an Oc4 d.b.h. ≥ 12.5 cm. d.b.h. and
 - c) are in condition class 1. Tree history is 1.
4. Conifers and red alders with tree history is 1 in condition class 1 whose Oc4 d.b.h. is obtained using "the half diameter" technique (page 108) BUT was measured conventionally at Oc3. (trees whose diameter grew and closed with another tree's diameter).

Do not bore hardwoods other than red alder ≥ 12.5 cm. d.b.h. and do not bore any trees that are < 12.5 cm. d.b.h.; reconstructed Oc3 d.b.h. for these trees will be estimated by regression or other techniques.

To obtain radial increment:

1. Bore the tree just below breast height, on the side of the tree facing the point. If slope and tree size make this impossible, bore the tree on the side opposite the point.
2. Count the number of growth rings since Oc3 from the cambium end of the core (see below, or Condition Class Attribute Item 34 on page 71 for the number of years to count).
3. Measure the length of this segment of the core to the nearest millimeter to get radial increment. Enter this radial increment.

The data recorder will calculate and enter Oc3 d.b.h. upon entry of the increment and Oc4 d.b.h.

How to calculate Oc3 d.b.h. without a data recorder:

1. Multiply the radial increment by 2.2 to convert to diameter increment outside bark.
2. Determine Oc3 d.b.h. by subtracting the answer from step a. from the measured Oc4 d.b.h.

The remeasurement period is 12 years on a plot that has no date of Oc3 inventory. Use the following guide to determine number of tree rings to count on plots visited at Oc3. Diameter growth of most tree species in temperate forests of the western United States occurs between June 1 and August 1, and often happens largely in the early part of that period. The remeasurement period is calculated and displayed in the tree data section of the husky, and is entered in "Item 34--Oc3 Remeasurement period" on CONDITION CLASS ATTRIBUTES (see page 71).

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
01	02	03	04	05	06	07	08	09	10	11	12
Do not count present inventory year if present date of inventory is one of these months					Count one year if present, previous, or both inventories were in these months.		Do not count previous inventory year if previous date is one of these months of inventory.				

- Example 1:** A plot in Deschutes County was visited May, 1987 and revisited Sept, 1998: the number of growing seasons is 12 -- 1987 through 1998.
- Example 2:** A plot in Jefferson County was visited June, 1987 and revisited June, 1998: the number of growing seasons is 11 -- 1987 through 1997 (or 1988 through 1998).
- Example 3:** A plot in Union County was visited May, 1987 and revisited Aug, 1999: the number of growing seasons is 13 -- 1987 through 1999.
- Example 4:** A plot was visited Oct, 1987 in Grant County and revisited October, 1998: the number of growing seasons is 11 -- 1988 through 1998.

Item 10--Oc3 d.b.h. (Oc3 DBH)

A 4-digit code displaying Oc3 d.b.h. to the nearest millimeter on live trees and to the nearest centimeter on snags. D.b.h. was measured on all live trees at Oc3 but crews were permitted to estimate d.b.h. on snags. Oc3 d.b.h. is printed/downloaded for all snags sampled ≥ 12.5 cm. d.b.h. at Oc3 and all trees sampled live and ≥ 2.5 cm. d.b.h. at Oc3. Some instructions for Oc3 d.b.h. are found in "Item 9--Oc3 to 4 Increment" (See page 102).

- If an Oc3 sapling is a conifer or a red alder, and now ≥ 12.5 cm. d.b.h., bore for Oc4 increment. If an other hardwood and ≥ 12.5 cm. d.b.h., simply delete the generic Oc3 d.b.h. and leave Oc3. d.b.h. blank.
- Do not change Oc3 d.b.h. on snags sampled at Oc3 (even though Oc3 d.b.h. may differ considerably from the Oc4 d.b.h.)
- On remeasured (##, R or X) subplots in condition class 1, estimate Oc3 d.b.h. on snags that were snags at Oc3 but missed at Oc3.

Item 9B--Oc3.5 to 4 Increment

A 3-digit code recording bored radial increment inside the bark to the nearest millimeter for the period between Oc3.5 and Oc4.

This bored increment is required for:

1. Trees for which an Oc4 increment is collected (see "Item 9--Oc3 to 4 Increment")
2. Conifers and red alders with a downloaded Oc3.5 d.b.h. that is greater than Oc4 d.b.h. or unreasonably smaller than Oc4 d.b.h. This applies only to trees:
 - a) sampled live at Oc3.5 and 4
 - b) have an Oc4 d.b.h. ≥ 12.5 cm. d.b.h. and
 - c) are in condition class 1.
 - d) with a tree history of 1.

Downloaded Oc3.5 d.b.h. for remeasurement trees, and calculated Oc3.5 d.b.h. for new trees, is not displayed on the tree data screen of the husky, but is in the data files.

Use the procedures shown above (in "Item 9--Oc3 to 4 Increment") to measure Item 9B--Oc3.5 to 4 Increment.

The remeasurement period is 6 years on a plot that has no date of Oc3.5 inventory. Use the following guide to determine number of tree rings to count on plots visited at Oc3.5. Diameter growth of most tree species in temperate forests of the western United States occurs between June 1 and August 1, and often happens largely in the early part of that period. The update increment remeasurement period is calculated and displayed in the tree data section of the husky, and is entered in "Item 35--Oc3.5 Remeasurement period" on CONDITION CLASS ATTRIBUTES (see page 71).

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
	01	02	03	04	05	////////		08	09	10	11	12
	Do not count present inventory year if present date of inventory is one of these months					Count one year if present, previous, or both inventories were in these months.		Do not count previous inventory year if previous date is one of these months of inventory.				

Example 1: A plot in Klamath County was visited Aug, 1992 and revisited July, 1998: the number of growing seasons is 6 -- 1993 through 1998.

Example 2: A plot in Wheeler County was visited May, 1992 and revisited Sept, 1998: the number of growing seasons is 7 -- 1992 through 1998.

Item 11--Oc4 d.b.h. (OC4 DBH)

A 4-digit code indicates Oc4 d.b.h. to the nearest millimeter. Oc3 and Oc4 d.b.h. are used in calculating volume, growth, average stand diameter, and stocking-related estimates such as forest type and stand size.

Record for trees sampled live at Oc4. Record for all snags sampled at Oc4 that are ≥ 12.5 cm. d.b.h. and ≥ 2 meters actual height on all subplots. Record for reconstructed culturally killed, dead, or harvested trees (TH 3, 5, or 8) tallied on C subplots in condition class 1; for reconstructed harvested trees, record stump diameter, not d.b.h. Diameter for seedlings is recorded as "0001".

Procedures for Oc4 d.b.h.

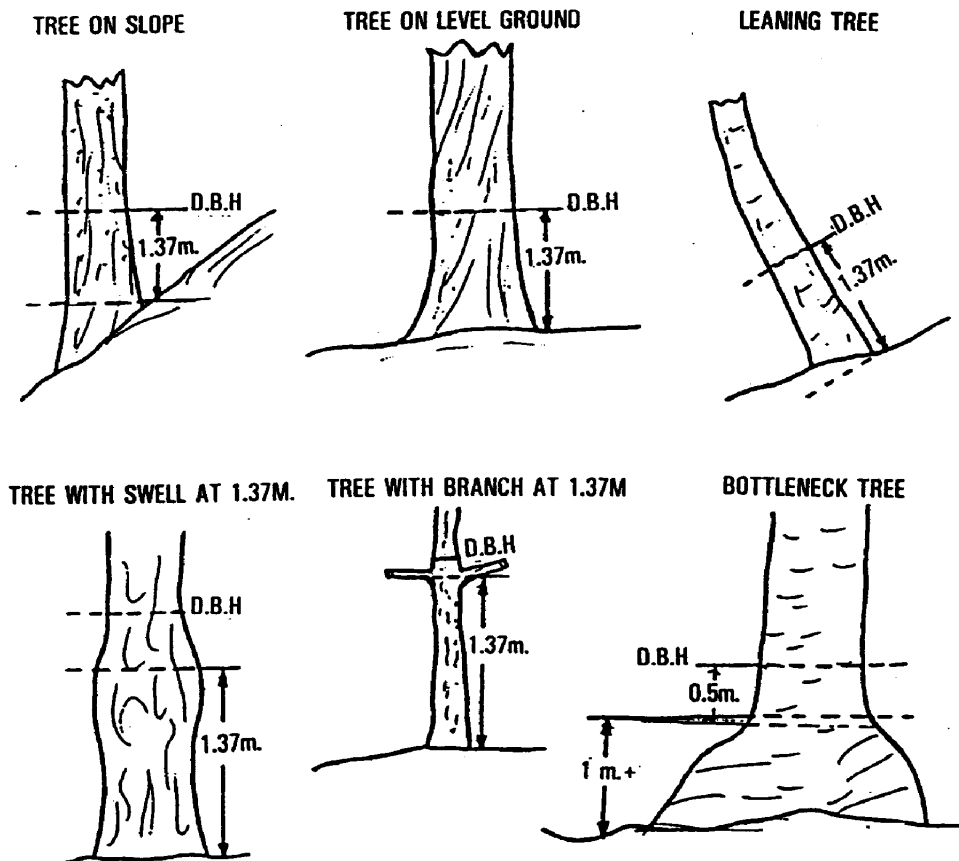
1. Marking d.b.h. on trees previously marked:

The place where diameter was measured at Oc3 on trees tallied live and ≥ 7.5 cm. d.b.h. at Oc3 was marked with an aluminum d.b.h. nail. On these trees, remeasure diameter at the location of the Oc3 nail. The old d-nail must be exposed enough so that it will not be overgrown in the next ten years (if possible). If the old nail cannot be pulled out to meet this requirement, set a new nail at the same location. If the old nail is missing, check the previous plot card for comments on the location of the old nail, and use this information to place a new nail on the bole. If there are no comments, follow the instructions in the next two paragraphs

2. Marking trees and snags ≥ 7.5 cm. d.b.h. tallied live for the first time at Oc4:

Set an aluminum nail at breast-height (1.37 m above ground level from the root collar, measured at the uphill side of the tree or snag). On level ground, place the nail on the side of the tree facing the sample point. On a slope, place the nail on the uphill side of the bole. Leave as much of the nail exposed as possible, but be sure it is firmly affixed to the tree.

Avoid irregularities in the bole when placing the nail on a new tree (see following figure). If the tree has swellings, bumps, depressions, or branches at breast-height, set the nail immediately above the irregularity, at a point where the stem has normal form. For trees sprouted from a stump, set the nail 1.37 meters above the point where the sprout leaves the stump.



3. General instructions on marking diameter:

If a tree or snag (new or remeasured) is 75.0 cm. d.b.h. or larger, affix an additional nail for every 30 cm. of diameter, distributing the nails evenly around the circumference of the bole. Set these nails while the diameter tape is girdling the tree at the point of diameter.

In remarks, note the distance from the root collar to the nail if this distance is less than 1.32 meters or greater than 1.42 meters.

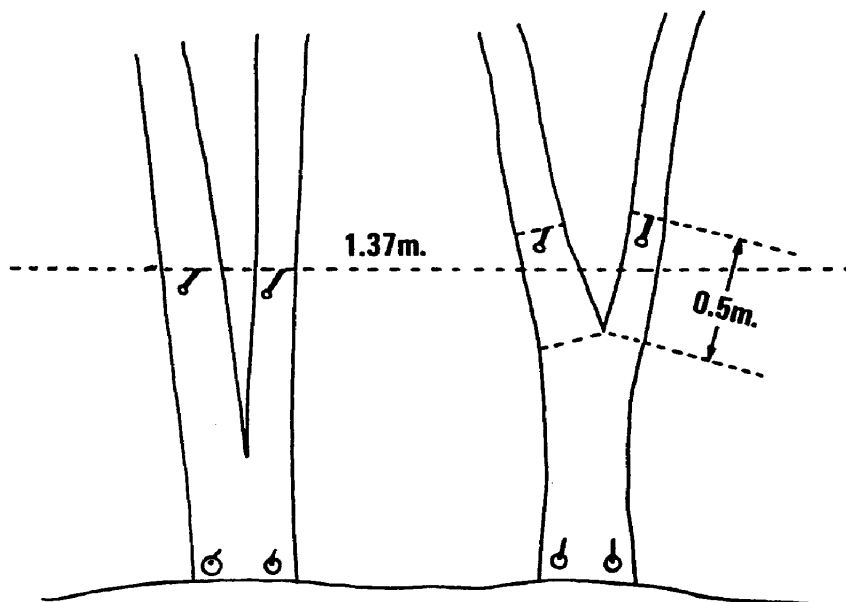
4. Measuring d.b.h.:

Measure d.b.h. directly above the dbh nail. On trees without dbh nails (trees less than 7.5 cm. d.b.h.), measure d.b.h. at a point 1.37 meters above ground level.

Before measuring d.b.h., remove any moss, poison oak or other vines, slugs, or anything else that may affect the diameter measurement. In addition, it may sometimes be necessary to remove a dead branch. Remove dead limbs only if the accuracy and efficiency of the measurement would be increased. Never remove live limbs!

5. How to measure d.b.h. under special circumstances:

- a) Diameter on forked trees sampled previously: Tally remeasured trees the same way they were tallied previously; if a forked tree qualified at Oc3 as two tally trees, treat it as forked and two tally trees at Oc4. Each fork ≥ 12.5 cm dbh or larger must be marked with a tree number tag on the side of the tree base where the fork occurs.
- b) Diameter on forked trees sampled for the first time: Crotch of fork at or above 1.37 meter. Consider as a single tree. Measure diameter below the swell caused by the fork, but as close to 1.37 m as possible.
- c) Crotch of fork below 1.37 meter: Consider each fork as a separate tree. Measure diameter at 1.37 meter above the ground or 0.5 meter above the crotch of the fork, whichever point is higher on the tree. Forks are tallied with the prism if the fork is "in" where d.b.h. is measured. Forks are tallied on the fixed-radius plots if the center of the tree at base is within the fixed-radius.

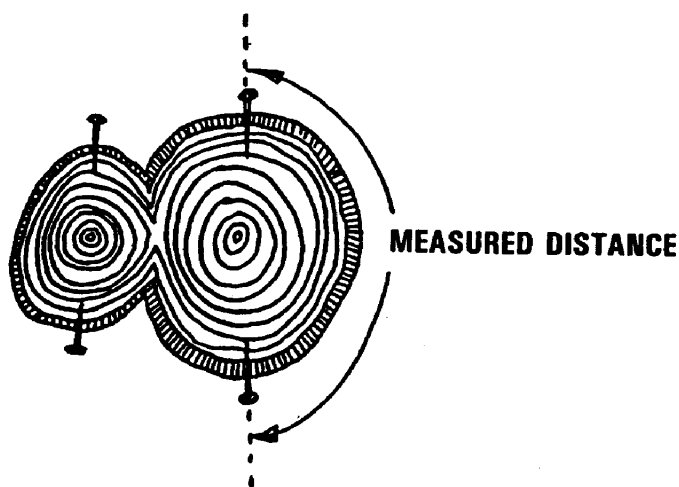


- d) Diameter on trees that have grown together: When two tally trees have grown together at d.b.h., they may have the appearance of forked trees, but should be treated as separate trees.
1. If the tree has a fully-measured diameter at a previous inventory, bore the tree for increment back to the time of last full diameter measurement. Fully-measured diameter means a diameter tape was extended completely around the tree to get the measured diameter. Increment is bored--if possible--on the side of the tree facing the subplot. Bore at the height the previous diameter was taken.

Multiply the radial increment by 2.2 to get diameter increment (outside bark) since Oc3. Add this diameter increment to the previous measured diameter to get the current (Oc4) diameter. Record the Oc4 diameter.

Divide the Oc4 diameter by two to determine a "half" diameter. Use the half diameter to place two diameter nails on the tree. Set the first nail at the height the previous diameter was measured. Use a diameter tape to measure out the half-diameter distance from the first nail. Set the second nail at the end of the taped half-diameter distance. Enter "half diameter" in remarks.

2. If the tree is a remeasured tally tree with a "double-nailed diameter" from a previous inventory, measure the half-diameter indicated by the two diameter nails. Multiply the half diameter by two. Record the result as Oc4 diameter. Note "double nail diameter" in remarks.
3. If the tree is a new tally tree, set two diameter nails at d.b.h. halfway around the tree's circumference from each other. Measure the distance between the nails with a diameter tape. Multiply the measurement by 2 and record the result as Oc4 diameter.



Example: Distance measured = 32.6 cm
 $32.6 \times 2 = 65.2$ cm

- e) Impossible to measure trees: If it is physically impossible to measure the diameter of a tree with a diameter tape because of huge forking, root collars, cliffs etc. then estimate the diameter as follows:
 - 1) Determine where d.b.h. should be measured. Mark d.b.h. with a diameter nail, if possible.
 - 2) Using a prism as a guide, move to a point on the ground at which the tree becomes borderline.
 - 3) Measure the horizontal distance from this point to the center of the tree. This is the tree's limiting distance.
 - 4) Using the limiting distance table on page 178, look up the diameter for this limiting distance.
 - 5) Record this diameter in Oc4 d.b.h. and enter "Prism-estimated d.b.h." in the remarks column. Bore for Oc4 radial increment if required in Item 9--Oc4 increment.
- f) Diameter on stump: Use a logger's tape or 30-meter tape to measure the longest and shortest axis across the top of the stump. Record Oc4 d.b.h. as the average of the two measurements.

Item 12--Oc3 height (Oc3 HT)

A 3-digit code indicating the total (normally-formed) height on live trees, and actual (not reconstructed) height on snags sampled at Oc3. Oc3 height is printed/downloaded for all trees sampled live and ≥ 12.5 cm. d.b.h. with a field-measured height at Oc3 and for all snags sampled ≥ 12.5 cm. d.b.h. at Oc3 (Snag heights were estimated to the nearest meter). Do not change the printed/downloaded Oc3 height on trees and snags even if the Oc4 height is greater than the Oc3 height. If this occurs, recheck that the Oc4 height is accurate.

Heights are displayed in decimeters. Field-measured Oc3 tree heights end in a number other than "0" and estimated heights end in "0". Height was recorded to the nearest meter on snags at Oc3.

The only Oc3 heights to collect: On remeasured (##, R or X) subplots in condition class 1, estimate Oc3 height on snags that were snags at Oc3 but missed at Oc3.

Do not record Oc3 height for trees sampled live at Oc3 which are still live and show no printed/downloaded Oc3 height. Do not record Oc3 height for trees culturally killed, dead, or harvested since Oc3 that are reconstructed as live at Oc3. Do not record Oc3 height for snags sampled on C subplots which were snags by Oc3.

Item 13--Oc4 height (Oc4 HT)

3-digit code indicating the total height of the tree. Height is recorded in decimeters. Measured heights may not end in zero. Estimated heights must always end in zero except for trees less than 5 meters tall. For trees less than 5 meters tall, record height to the nearest decimeter (i.e. these trees may not end in a zero).

Do not change a downloaded/printed Oc3 height even if it is greater than the Oc4 height; if Oc3 height exceeds Oc4 height, double-check that the Oc4 height is accurate.

Record a field-measured or field-estimated height for:

1. All trees sampled live at Oc4.
2. All snags that are ≥ 12.5 cm. d.b.h. and ≥ 2 meter tall and leaning < 45 degrees.
3. Trees culturally-killed or dead that are reconstructed as live at Oc3 if the tree is still intact enough to allow getting an accurate normally-formed height.

For trees live and < 12.5 cm. d.b.h. at Oc4 on each 2.41/2.96-meter fixed-radius subplot:

1. Measure total Oc4 height on first sapling (2.5-12.5 cm. d.b.h.) tallied clockwise from north that meets the following criteria: the tree is an estimated 5 meters or more tall and has a live, normally- formed height.
2. Then, estimate or measure actual height on all other live saplings and seedlings.

For trees live and ≥ 12.5 cm. d.b.h. at Oc4 on each subplot:

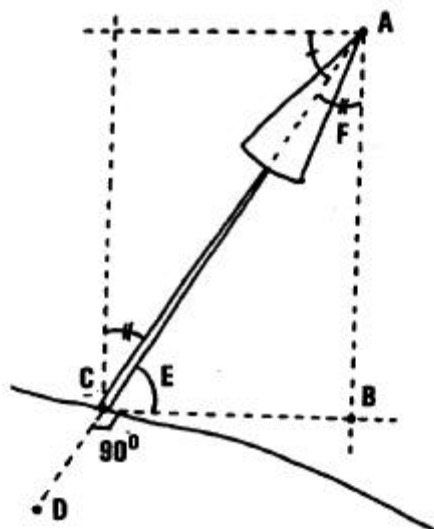
1. Measure Oc4 height on the first tree tallied clockwise from north that has a downloaded Oc3 height and a normally-formed height. If the Oc4 height is less than the printed/downloaded Oc3 height, make sure the Oc4 height is accurate; the data recorder will prompt that the discrepancy exists. Do not change the Oc3 height even if it greater than the Oc4 height.
2. If no tree with a downloaded Oc3 height qualifies for height remeasurement, then measure Oc4 height on the first tree encountered clockwise from north that has a normally-formed height.
3. Measure Oc4 height on an additional tallied tree with a normally-formed height and d.b.h. of ≥ 12.5 cm. Select a dominant or codominant tree, if available.
4. Then, measure or estimate normally-formed height for the remaining trees ≥ 12.5 cm. d.b.h.

Normally-formed height: A conifer with a normally-formed height has a central bole and no deformities (such as a crook, fork, or missing or dead top). A hardwood with a normally-formed height has a complete bole with no missing top. Some hardwood species (e.g. alder and cottonwood) typically have a single bole well up into the crown. Other species (e.g. oak, maple, ash, and madrone) typically fork much lower on the bole -- a condition that represents normal form and height for these species.

Height on poorly-formed trees: Reconstruct total (normally-formed) tree heights by estimating what the height would be were there no deformity in the main bole. Deformities include missing tops, and large crooks and forks above 1.37 meters. As a basis for estimating the normally-formed height, measure the tree's actual (poorly-formed) height and examine normally-formed trees of the same species and age in the same stand. A tree with reconstructed Oc4 tree height is coded with an "R" in the column to the right of Oc3 height (example: 410R).

Height on leaning trees: Measure or estimate total normally-formed bole length (from the base to the tip of the tree), and not the perpendicular from the ground to the tip. To measure heights of leaning trees using a clinometer, follow these steps:

1. Move to a point along a line (point D) that is perpendicular to the plane in which the tree is leaning.

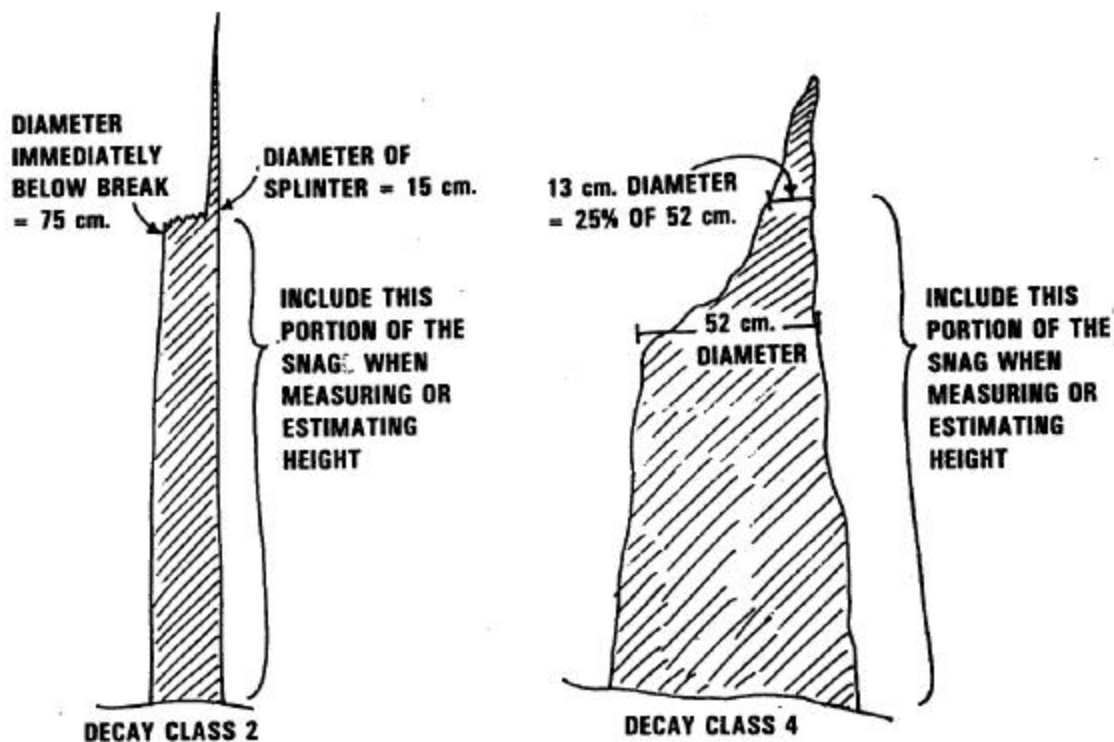


2. Using your clinometer, measure the height of point A above point B.
3. By standing at the base of the tree and sighting up the bole with your clinometer, measure the slope of the bole in degrees. (Angle E in the diagram above)
4. Subtract the degrees of lean (step 3.) from 90 degrees. This gives you the degrees of angle F.
5. By sighting through your clinometer, convert the angle calculated in step 4 to a percentage.
6. Use the slope correction table on page 177 to determine the expansion factor for the percent slope determined in step 5. Multiply the expansion factor by the measured distance from point A to point B (step 2). This gives the length of the bole (point A to point C).

Height on a tree forked below d.b.h. (tallied as two or more trees): The height of the tallest stem shall include the height of the main bole below the fork. The height(s) of the other stem(s) shall be only height from fork to top.

Height on snags: Snag height is always actual height, the distance from the ground to the actual top of the snag; do not include missing tops as part of the recorded height. Snag height, recorded to the nearest decimeter, may be measured or estimated.

Snags often have broken, irregular tops. When measuring or estimating heights on such snags, use the "25-percent" rule to determine the point on the bole to which height should be taken. Include as part of the height, shattered or splintered segments up to the point where the diameter of the "broken" segment has a diameter that is 25 percent of the diameter of intact bole just below the broken portion. See diagram below.



Item 14--Breast-height age (BH AGE)

A 3-digit code indicating age at breast height. This variable is used in determining stand age, and in developing regression estimators of tree growth, mortality and harvest. On trees sampled live at Oc3, BH age is printed/downloaded; if bored for age previously, age is followed by an asterisk "*". Oc3 BH ages on these trees has been updated to Oc4 (1998).

All live tally trees ≥ 1.37 meters tall require breast-height age. Age may be estimated, but bored ages are always preferred. For trees ≥ 1.37 meters tall that are reconstructed as live at Oc3 and culturally-killed, dead, or harvested since Oc3, estimate breast-height age at the time of demise.

Do not change the printed/downloaded age for trees sampled live at Oc3 that were culturally-killed, died or were harvested since Oc3; their age will be backdated in the office by computer.

If available, bore on each subplot at least one live conifer or alder tally tree ≥ 12.5 cm. d.b.h. not previously bored; pick trees representative of the range of species, tree sizes and age classes present on the plot. Estimate age for trees tallied for the first time using the bored ages as a guide. Examine and correct, as needed, the printed/downloaded breast-height ages on trees that are still live tally. Tree age data collected by boring at Oc3.5 is not downloaded to husky. Obtaining these ages from the written plot cards and updating them to the current year may save time in the collection of bored ages.

A special case: Bore for breast height age, any conifer or red alder with a tree history of 1, 4, or 6 and with an Oc4 d.b.h. ≥ 12.5 cm. d.b.h. that was < 2.5 cm. d.b.h. at Oc3.

If you bore the tree for a breast-height age, record an "+" to the right of age. If you can determine breast-height age accurately by counting branch whorls on pines and true firs < 12.5 cm. d.b.h. and Douglas fir seedlings, record a "+" to the right of age. The "+" to the right of age is entered on the Husky data recorder by typing a "V" after the age.

After boring a tree for age, leave the extracted increment core at the base of the tree (for the convenience of the check-plotter!).

Determining breast-height age of large trees: To determine the age of a tree whose radius is greater than the length of the increment borer, use the following procedure:

1. Bore into the tree as far as possible, extract the core, and count the rings.
2. Count the number of rings in the inner 5 cm. of the core.
3. While the increment borer is still in the tree, measure the length of the borer that is exposed.
4. Subtract this length (3) from the total length of the increment borer.
5. Divide the tree's d.b.h. by 2.
6. Subtract (4) from (5). This gives you the distance by which you are short of reaching tree center.
7. Divide this number (6) by 5. This tells you how many 5-centimeter lengths you were short by.
8. Multiply this number (7) by the number of rings in inner 5 centimeters (2).
9. Add this number (8) to the total number of rings in the extracted core (1). This is the tree's estimated breast-high age.
10. Note "extrapolated age" in the remarks column.

Example: Determine the age of a 148.8-cm Douglas-fir. The core has 110 rings, and has 10 rings in the inner 5 cm. 2 cm. of the 41-cm-long increment borer did not penetrate the tree. Each number below is associated with its corresponding step above:

- Step 1: **110** rings counted
Step 2: **10** rings in the inner 5 cm. of the core
Step 3: **2** cm. is the length of the borer which is exposed
Step 4: 41 cm. is the total length of the borer - 2 cm. which is the exposed length = **39 cm.**
Step 5: 148.8 is the tree's dbh and you then divide by 2 = **74.4** cm to center of tree (pith)
Step 6: 74.4 cm. (true center) - 39 cm. (measured core) = **35.4** cm short of reaching the pith
Step 7: 35.4 cm./ 5 = **7.1 (5 cm.) lengths short**
Step 8: 7.1 (from step 7) x 10 (from step 2) = **71** rings not counted
Step 9: 110 rings counted (step 1) + 71 rings not counted (step 8) = **181 years old at breast height**
Step 10 In the remarks column note **"extrapolated age"**

Item 15--Oc3 crown ratio (C)

A 1-digit code printed/downloaded for all trees tallied live at Oc3. Codes are the same described in "Oc4 crown ratio". Change the printed/downloaded code if obviously incorrect. Estimate Oc3 crown ratio for reconstructed trees.

Item 16--Oc4 crown ratio (R)

Record a 1-digit code for all trees tallied live. Compare the Oc4 estimate with Oc3 crown ratio, if downloaded, for reasonableness and continuity.

Crown ratio is the percent of a tree's total height that supports living crown. Total height includes dead, broken, or missing portions of the tree. For trees of uneven crown length, ocularly transfer lower branches on the fuller side to fill holes on the sparse side until a full, even crown is created. Base your estimate on this "created" crown.

Crown ratio codes are displayed in the following tabulation:

Code	Percent Live Crown
1	01 - 10
2	11 - 20
3	21 - 30
4	31 - 40
5	41 - 50
6	51 - 60
7	61 - 70
8	71 - 80
9	81+

Crown ratio is an indicator of a tree's vigor. In data analysis, trees with a crown ratio of 30 percent or less are considered less vigorous. For this reason, be particularly careful when deciding between codes "3" and "4." You may want to use your clinometer to measure live crown ratios on these trees.

Item 17--Oc3 crown class (C)

1-digit code printed/downloaded for all trees tallied live at Oc3. Codes are the same described in "Oc4 crown class". Change the printed/downloaded code if obviously incorrect. Estimate Oc3 crown ratio for reconstructed trees.

Item 18--Oc4 crown class (C)

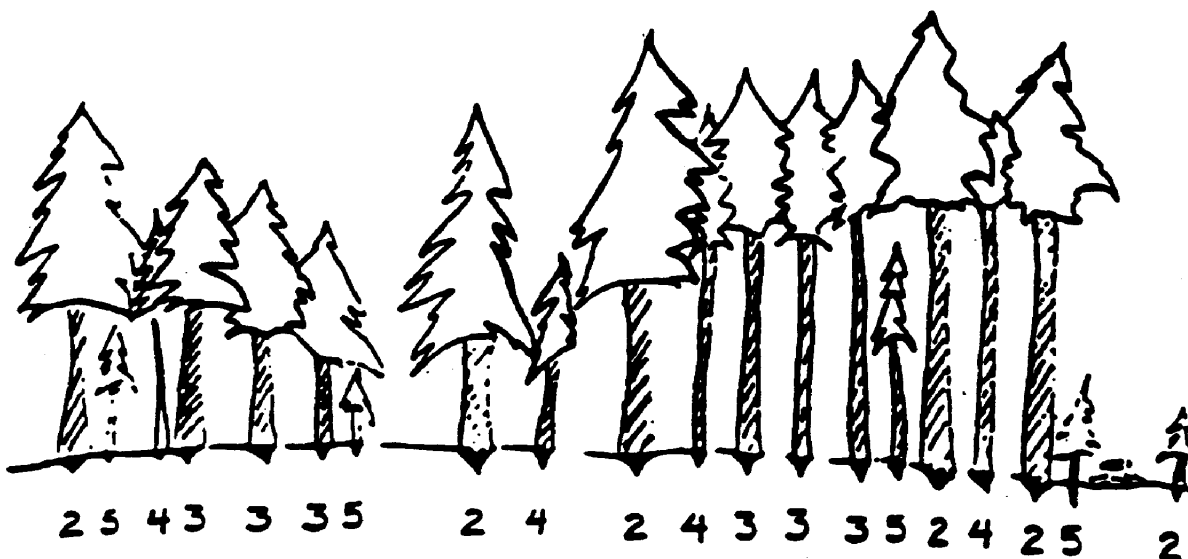
Record a 1-digit code for all trees tallied live. Compare the Oc4 estimate with Oc3 crown class, if downloaded, for reasonableness and continuity. Crown class describes a tree's "social" position in the stand and may indicate how well the tree is competing for light.

Code	Crown class	Definition
2	Dominant	Crown extends above the general level of the canopy; it receives full light from above and some direct light from the sides. (Includes open-grown trees.)
3	Codominant	Crown is part of the general level of the canopy; it receives full light from above but little light from the sides. Crown is usually medium-sized and somewhat crowded by other trees.
4	Intermediate	Tree is shorter than dominants or codominants; crown is below or barely reaches into the main canopy formed by dominant and codominant trees. Crown receives little direct light from above and none from the sides. Crown is usually small and quite crowded against other crowns.
5	Overtopped	Crown is entirely below the general level of the canopy; it receives no direct light from above or from the sides.

For Oc4 crown class, record the crown class that describes a tree's current social position. Oc3 and Oc4 crown classes for a tree may differ. For example, a tree was classified as an intermediate tree with its crown mostly beneath the canopy of a dense stand at Oc3. At Oc4, the tree stands alone in full sunshine from above and on its sides because its neighboring trees were removed in a heavy partial harvest; the tree is classified at Oc4 as a dominant or open grown tree.

Crown classifications are easily applied in even-aged stands. Classifications are more difficult to assign in uneven-aged stands or in plots where more than one stand is present. In these situations, classify the tree based on its immediate environment. In other words, base your classification on how much light the tree's crown is receiving, not its position in the canopy. The intermediate and overtopped crown classes are meant to include trees seriously affected by direct competition with adjacent trees.

For example, a young, vigorous tree that is considerably shorter than other trees in the stand--but that is not overtopped by other trees and that receives full light from above and partly from the side--is classified as dominant. The same principle applies to two-storied stands: understory trees should only be assigned subordinate crown classes if they are adjacent to overtopping trees. In plots with scattered residual overstory trees over younger trees, a considerable portion of the understory trees will be classified as dominant or codominant.



Item 19--Mistletoe (M)

A 1-digit code required for all conifers and oaks sampled live at Oc4. The code indicates the degree of infection of dwarf mistletoe on conifers, and leafy mistletoe on hardwood, juniper, and incense cedar trees. This item is used to describe the extent and severity of mistletoe infection.

The item is printed/downloaded for all trees sampled live at Oc3. If the tree is alive at Oc4, change the printed/downloaded code if now inaccurate. If the tree is now culturally-killed, dead, or harvested, do not change the printed/downloaded code.

Conifers and oaks tallied as culturally-killed, dead, or harvested, and reconstructed as live at Oc3 require an estimated mistletoe rating as of Oc3. Coding scheme follows:

Dwarf Mistletoe on conifers other than incense cedar and juniper:

Trees <7.5 cm. d.b.h.

<u>Code</u>	<u>Description</u>
0	No dwarf mistletoe infection.
1	Dwarf mistletoe infection in either upper or lower half of crown, but not in both. No brooms.
2	Dwarf mistletoe infection in both upper and lower halves of crown, or with one or more brooms anywhere in the crown.

Trees 7.5 cm. d.b.h. and larger

"Score" the mistletoe code as follows:

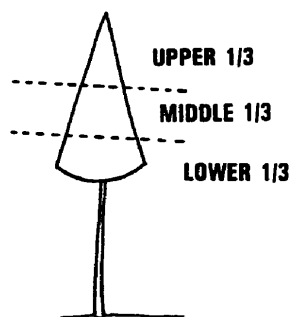
- 1.) Visually divide the live crown into thirds
- 2.) Score infections in each third as follows.

<u>Score</u>	<u>Description</u> (A bole infection counts as a branch infection.)
0	No infection.
1	50 percent or less of the branches infected; no brooms.
2	More than 50 percent of the branches infected; or one or more brooms.

- 3.) Sum the scores for each third. Code the total.

Example: A tree has no infection in top third of crown, light infection in the middle third, and has two brooms in the lower third.

The total score is: $0 + 1 + 2 = 3$; the code is: "3"



Leafy Mistletoe on oaks, incense cedar and juniper: (Any size tree)

<u>Code</u>	<u>Description</u>
0	No leafy mistletoe is present
7	Leafy mistletoe is present

Item 20--Hardwood clump (CL)

A 1-digit code printed/downloaded for hardwoods sampled live at Oc3. At Oc3, the code indicated if a hardwood was part of a clump (code "1") or was not part of a clump (code "0"). At Oc4, if a hardwood is part of a clump, the clump is assigned a clump number, and the number is recorded for each hardwood tallied that is part of the clump. If a hardwood is not part of a clump, "0" is recorded for the tree. Clumps with tallied trees are numbered in consecutive order on a subplot starting with "1".

Example: Maple trees in three different maple clumps are tallied on a subplot. Trees tallied that are in the first clump are coded "1" for hardwood clump. Trees tallied that in the second clump are coded "2" for hardwood clump, and trees tallied that in the third clump are coded "3" for hardwood clump.

A clump is defined as 3 or more live hardwood stems originating from a root system from a tree now gone. Hardwood clumps typically arise from old stumps that are left from cutting or from natural mortality. Each fork of a forked tree counts as one stem if the fork is below d.b.h. and must be entered on a separate line. Do not tally seedling-sized suckers that have sprouted from the base of a live, unsuppressed hardwood stem that is ≥ 12.5 cm. d.b.h.

Clump data are used in adjusting stocking estimates; trees growing in clumps contribute less stocking than those growing as individuals.

Item 21--Cull other/hardwood form class (CO)

This item is used in calculating net tree volume. For conifers, a 2-digit code indicates the percent of volume--to the nearest one-percent--of the volume lost due to broken or missing parts, forks, or crooks. For hardwoods, a 1-digit code indicates the tree's form. The code is recorded on only on trees ≥ 12.5 cm. d.b.h. Do not code for trees culturally-killed, dead or harvested that are reconstructed as live at Oc3.

Conifers ≥ 12.5 cm. d.b.h.: For conifers sampled live and ≥ 12.5 cm. d.b.h. at Oc4, record a 2-digit code to indicate the percent of sound cull. Code only when 1 meter or more of the tree is defective. Record the reason for the Oc4 deduction by recording an damaging agent code in Item 23, 25, or 27; a severity rating is not required.

This item has been printed/downloaded for conifers sampled live and ≥ 12.5 cm. d.b.h. at Oc3. If still live tally, use the printed code only as a guide. Determine percent cull according to the current rules, and correct the printed/downloaded codes if obviously in error. For conifers now culturally-killed, dead or harvested which were ≥ 12.5 cm. d.b.h. at Oc3, downloaded "cull other" should not be changed and coding of damaging agent is not required.

If the conifer does not have a minimum log (3.8 m), code this item "99."

Use the following guide and tables showing merchantability standards and the percentage distribution of volume by log, to determine the percent of cull other on conifers.

1. **Top out:** Cull one meter below the break for splintering, plus the entire top above the break.
2. **Fork:** When the crotch of the fork is below 1.37 meter, treat as separate trees with no cull. When the crotch of the fork is above 1.37 meters, cull only if additional volume in a second stem does not compensate for the volume reduction in the main stem. Forked trees often have as much or more volume than trees without forks.
3. **Crook:** Cull for one meter or more of buck-out loss.

Conifer merchantability minimums

	Size class (cm)	Stump height (cm)	Log length (m)	Minimum top diameter outside bark (cm)
Poletimber	12.5-22.4	30	2.5	10
Sawtimber	22.5+	45	5.0	18

**Percentage distribution of total tree volume
for sawtimber conifers (22.5 cm. d.b.h. and larger)**

(5-meter logs)

Tree height (in logs)	Log number											
	1	2	3	4	5	6	7	8	9	10	11	12
1	100											
2	70	30										
3	55	35	10									
4	41	31	20	8								
5	32	27	21	14	6							
6	27	23	19	15	11	5						
7	23	20	17	15	12	8	5					
8	20	18	16	14	12	9	7	4				
9	17	16	15	13	11	10	8	6	4			
10	16	15	13	12	11	10	8	7	5	3		
11	14	13	13	11	11	10	8	7	6	4	3	
12	14	13	12	11	10	10	8	7	6	4	3	2

**Percentage distribution of total tree volume
for hardwoods and poletimber conifers (conifers 12.5-22.4 cm. d.b.h.)**

(2.5 m logs)

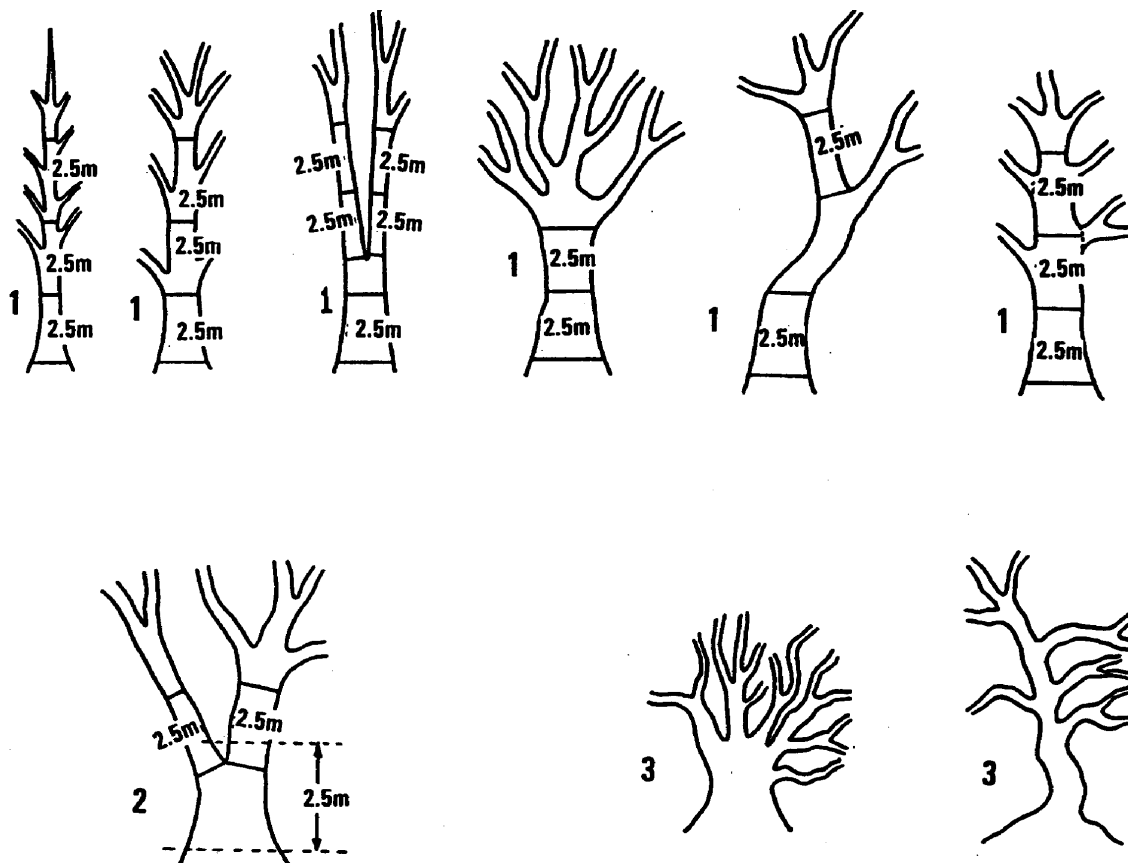
Tree height (in logs)	Log number									
	1	2	3	4	5	6	7	8	9	10
1	100									
2	55	45								
3	41	33	25							
4	33	28	22	17						
5	28	24	20	16	12					
6	25	22	18	15	12	8				
7	22	20	17	14	12	9	6			
8	20	18	16	14	11	9	7	5		
9	18	17	15	13	11	9	7	6	4	
10	17	16	14	12	10	9	8	6	5	3

Hardwood ≥ 12.5 cm. d.b.h.: Hardwood tree form is entered in cull other. Downloaded/printed for hardwood trees sampled live and ≥ 12.5 cm d.b.h. at Oc3. Update for these trees if still alive. Record for all new live hardwood trees tallied that are ≥ 12.5 cm d.b.h.. Do not record for reconstructed hardwood trees ≥ 12.5 cm dbh that have died, or have been killed or harvested. Coding of damaging agent is not required to describe hardwood cull other.

Code	Description
1	First 2.5 meters above stump is straight. (A log is considered straight if a line drawn through the centers of both ends of the log does not pass outside the curve of the log.)
2	First 2.5 m above stump is NOT straight; but must have at least one straight log elsewhere in the tree.

- 3 No logs anywhere in tree due to form. Includes the sea serpents, octopi, giant tumbleweeds, pretzels, cauliflowers, and various free form trees.

HARDWOOD TREE FORMS



Item 22--Cull rot (CR)

Record a 2-digit code noting the presence of visual indicators of rot for all trees sampled live and ≥ 12.5 cm. d.b.h. Cull rot is printed/downloaded trees sampled live and ≥ 12.5 cm. d.b.h. at Oc3. If still live, update the cull rot code according to the current rules and correct the code if obviously in error. For incense cedar, western juniper, and all hardwood and pine species record only a "01" or "99".

Code Indicator

- 01 No indicators present: or, no indicators are recorded for this tree species.
- 02 Basal injury: Open or closed wound in contact with the ground. Wound is at least 10 years old, caused by fire, lightning, falling trees, or mechanical injuries. Do not include frost cracks.
- 03 Conks: Indian paint fungus (E. tinctorium), or red ring rot (P. pini).

- 04 Trunk injury: Open or closed, 3 decimeters or longer, at least 10 years old, below merchantable height, not in contact with ground. Caused by axe blazes, animals, falling trees, or mechanical damage. Do not code this if the injury overlaps length-wise with a frost crack.
- 05 Frost cracks: Open or closed seams or scars probably caused by freezing. Commonly associated with wet wood at the base of tree. Trees with bleeding frost cracks at their bases often have E. tinctorium conks higher on their trunks.
- 06 Dead or broken top: Dead or spike top caused by insects, rust fungi, mistletoe, or other insect and disease factors. Or, top of tree is broken by wind, ice or snow and heartwood is exposed to wood-decay fungi. Greater than 2 years old. Do not consider small crooks or forks.
- 07 Basal and trunk injuries: Code this combination when 2 injuries occur and do not overlap length-wise in the first log. If they do overlap, record only the basal injury. Do not combine this with a code of "2" or "4".
- 08 Basal and top injuries: Code this combination when 2 injuries occur. Do not combine this with a code of "2" or "6".
- 09 Trunk and top injuries: Code this combination when 2 injuries occur and do not overlap length-wise in the top of the tree below merchantable height. If they do overlap, record only the trunk injury. Do not combine this with a code of "4" or "6".

Combinations of the above injuries are likely to occur. To code combinations, use the second digit to record the additional injury. For example:

<u>Code</u>	<u>Indicator</u>
37 or 73	conks with basal & trunk injuries
35 or 53	conks with frost crack
29 or 92	basal, trunk & top injuries
56 or 65	frost crack with top injury

- 99 Rotten cull: for all species. Record obvious cull which may or may not have been identified above. Code for trees with visible rot involving greater than 75 percent of their gross board foot volume. For example:

<u>Species</u>	<u>Indicator</u>
746 Quaking aspen	White trunk rot (<u>F.ignarius</u> var. <u>populinus</u>), one conk.
081 Incense cedar	Pecky rot (<u>P.amarus</u>), one conk.
All true firs Douglas-fir Mt. & W. hemlock	Indian Paint fungus (<u>E. tinctorium</u>) or Red ring rot (<u>P.pini</u>) (either of these conks must cover at least 60% of the bole & Douglas-fir w/ pini must be \geq 140 years old)
Hardwoods	Greater than 200 years old with any visible rot.

Items 23 through 28--Damaging agent/severity (Agt, S)

Damaging agent: a 2-digit code entered, if needed, in three agent fields (Item 23, 25 and 27). Severity: a 1-digit code entered, if required, in three severity fields available (Item 24, 26, and 28). For all trees tallied live at Oc4, record up to 3 damaging agents, each with a severity rating (if required).

The agent and severity codes are used to indicate the type of agents present on a tree and describe their severity. Several damaging agents are automatically of highest importance and should be coded before any other agents; these agents carry an asterisk (*) after their name in the listing below. The order in which multiple damaging agents are recorded is otherwise arbitrary and need not imply a primary-secondary relationship. If more than three damaging agents are found on a tree, then code the three agents thought to have the most impact on forest conditions in the condition class.

Damaging agent and severity coding replaces the growth impactors collected at Oc3. For each tree sampled live at Oc3, growth impactor codes have been converted to comparable agent codes and printed/downloaded into Item 23, Agent 1. If still live at Oc4, inspect the tree to see whether the converted code is still valid, requires updating to a different agent present, or should be set to "00" which indicates "no damaging agents present". If additional agent(s) are present, code for them in Agent 2 and Agent 3. On trees live at Oc4, agent codes other than "00" each require a severity rating. Downloaded agent codes 27 and 52 always require updating to another code.

If a tree sampled live at Oc3 is now culturally-killed, dead, or harvested, do not change the downloaded code in Agent 1 nor enter a code in Severity 1. Trees dead or harvested, sampled live at Oc3 or reconstructed as live at Oc3 require a cause of death code or harvest use code entered in Agent 2 (Item 25), but Severity 2 (Item 26) is not coded, and no other agents or severities should be added elsewhere. Cause of death and harvest use are discussed on page 124.

Agents and their severity ratings are grouped by broad class. Each class has a general agent and specific agents listed. The general codes should be used if there is any question as to the identity of the specific damaging agent.

Bark beetles:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
01	General/other bark beetle	1	Unsuccessful current attack
02	Mountain pine beetle	2	Successful current attack
03	Douglas-fir beetle	3	Last year's successful attack
04	Spruce beetle	4	Older dead
05	Western pine beetle	5	Top kill
06	Pine engraver beetle		
07	Fir engraver beetle		
08	Silver fir beetle		
09	Red turpentine beetle		

Note: Bark beetles often attack trees weakened by root disease fungi. Carefully evaluate trees suffering bark beetle attack for evidence of root disease.

Defoliators:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
10	General/other	1 to 9	Divide live crown into thirds.
11	Western blackheaded budworm		Rate each third separately based on
12	Pine butterfly		the following classes:
13	Douglas-fir tussock moth		0 - No detectable defoliation
14	Larch casebearer		1 - Up to 33% of foliage (old and new) missing
15	Western spruce or Modoc budworm		2 - 34 to 66% of foliage missing
16	Western hemlock looper		3 - 67 to 100% of foliage missing
17	Sawflies		
18	Needle and sheath miners		Obtain severity rating by adding ratings for each
19	Gypsy moth		third. Record total.

Other insects:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
20	General	1	Bottlebrush or shortened leaders, 0-2 forks on the tree's stem, Or: less than 20% of the branches affected, Or: <50% of the bole has visible larval galleries.
21	Shoot moths		
22	Weevils		
23	Wood borers		
24	Balsam wooly adelgid (aphid)		
25	Sitka spruce terminal weevil	2	3 or more forks on the tree's bole, Or: 20% or more of the branches are affected, Or: the terminal leader is dead, Or: $\geq 50\%$ of the bole has visible larval galleries.

White pine blister rust:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
36	White pine blister rust	1	Branch infections located more than 60 cm. from tree bole.
		2	Branch infections located 15 to 60 cm. from bole.
		3	Bole infections present, Or: branch infections within 15 cm. of bole.

Stem-branch cankers:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
40	General/other	1	Branch infections present. <50% of the crown affected.
41	Western gall rust (Pipo, Pico)		
42	Commandra blister rust (Pipo)	2	Branch infections present. $\geq 50\%$ of the crown affected, Or: any infection on the bole.
43	Stalactiform rust (Pico)		
44	Atropellis canker (Pinus spp.)		
45	Cytospora or Phomopsis (Psme, Abies spp.)		
31	Gymnosporangium (Juoc)		

Stem decays:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
46	General/other	1	1 conk on the stem or present at ground level.
47	Red ring rot (P. pini)	2	2 or more conks separated by <40 cm. on bole.
48	Indian paint rot (E. tinctorium)	3	2 or more conks separated by ≥ 40 cm. on bole
49	Brown cubical rot (P. schweinitzii)	4	No conks. Visible decay in the interior of the bole.
		5	No conks, No visible decay.

Special agents:

<u>Code</u>	<u>Agent</u>	<u>Severity/Instructions</u>
27	Other disease coded at Oc3	Inspect tree for specific disease agent. Code 27 always requires updating to another code. Update 27 to an agent code 40 thru 49 or 55 thru 58, set to 00, or code for another non-disease agent present. If coded other than 00, a severity rating is required for the new agent code.
50	Suppression *	No severity rating. Code this agent if tree is overtopped by other trees and will not live 10 more years, Or: will prevent a sapling from reaching 12.5 cm. d.b.h.
51	Excessively deformed sapling *	No severity rating. Code this agent on live trees (2.5-12.5 cm. d.b.h. that will never produce a minimum log. A minimum log for conifers is 5 meter long, and, for hardwoods, 2.5 meter long.
52	Insects coded at Oc3	Inspect tree for specific insect agent. Code 52 always requires updating to another code. Update 52 to agent code 1 thru 25, set to 00, or code for another non-insect agent present. If other than 00, severity rating is required.

Foliar pathogens:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
55	General/other	1	<20% of foliage affected, Or: <20% of crown in brooms.
56	Rhabdocline (only on Psme)		
57	Elytroderma (only on Pipo)		
58	Broom rusts (only on Abies and Picea spp.)	2	≥20% of foliage affected, Or: >20% of crown in brooms.
59	Swiss needle cast		

Root diseases: (see Appendix 11 for identification of individual root disease symptoms)

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
60	General/other	1	Tree is a live tally tree within 9 m. of a tree or stump that has a root disease to which the tally tree is susceptible. Enter the agent code
61	Annosus root disease		
62	Armillaria root disease		
63	Black stain root disease		
65	Laminated root rot		
66	Port-Orford-cedar root disease	2	Live tally tree with signs or symptoms diagnostic for root disease such as characteristic decay, stain, ectotrophic mycelia, mycelial fans, conks or excessive resin flow at the root collar. No visible crown deterioration.
		3	Live tally tree with signs or symptoms diagnostic for root disease such as characteristic decay, stain, ectotrophic mycelia, mycelial fans, conks, or excessive resin flow at the root collar. Visible crown deterioration such as thinning chlorotic foliage, reduced terminal growth, and/or stress cones.

Animal agents:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
70	Animal: general/unknown	1	<20% of the crown is affected. Bole damage is restricted to less than half of circumference.
71	Mountain beaver		
72	Livestock		
73	Deer or elk	2	≥20% of the crown is affected. Bole damage to half or more of circumference.
74	Porcupines		
75	Pocket gophers, squirrels, mice voles, rabbits, hares.		
76	Beaver		
77	Bear		

Weather agents:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
80	Weather: general/unknown	1	<20% of the crown is affected.
81	Windthrow or wind breakage		
82	Snow/ice bending or breakage	2	≥20% of the crown is affected, Or: any damage to the bole.
83	Frost damage on shoots		
84	Winter desiccation		
85	Drought/moisture deficiency		

Other agents:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
86	Sun scald	1	<20% of the crown affected.
87	Lightning		
90	Other: general/unknown	2	≥20% of the crown affected, Or: any damage to the bole.
91	Logging damage		
92	Fire: basal scars or scorch		
93	Improper planting		
94	Air pollution or other chemical damage		

Physical defects:

<u>Code</u>	<u>Agent</u>	<u>Code</u>	<u>Severity</u>
95	Unspecified physical defect	0	Severity is not rated
96	Broken, missing, or dead top *		
97	Forked top *		
98	Crooks		
99	Checks/bole cracks		

Code for physical defect only if Item 21, Cull other is greater than "0". Only codes 96 and 97 are of much importance. Code 95, 98, and 99 only after any other agents present are coded.

* denotes an agent automatically considered of highest importance. Code this agent first.

Item 25--(Agent 2) Cause of death/Wildlife use or Reason for disappearance/Harvest use

The Item 25 data element is used to code cause of death for mortality trees, wildlife use or reason for disappearance for snags, and harvest use for harvested trees.

1. **Mortality trees:** Tree history is 5. Record a 2-digit code to indicate the cause of death of a tree sampled or reconstructed as live and ≥ 2.5 cm. d.b.h. or larger at Oc3. Use the same codes listed for damaging agent but do not use code 27, 51, or 52. Do not code severity. If the mortality tree is also a snag (tree history 7) entered on a separate line, enter a Wildlife use code for the snag record.

Two causes of death may be coded. The primary cause is entered in Agent 2 and the secondary cause, in Agent 3.

Cause of death is used to analyze tree mortality and calibrate mortality estimators.

2. **Snags:** Tree history is 7. A 1-digit code is required for all snags to indicate wildlife use or reason for disappearance. If a snag tallied at Oc3 is still qualifies as a snag at Oc4, code for use by wildlife; code "01" if a cavity or den is present, or "00" if there is no cavity or den. Snags still present also should be coded for Oc4 decay class in Item 26. If a snag tallied at Oc3 is now "gone" or no longer qualifies as a snag, code the reason for demise.

Code Wildlife use or Reason for disappearance

00 No cavity or den present.

SNAG PRESENT

01 Cavity or den present.

02 Fell over "naturally" (wind, decay, etc.) or no longer self-supported; still present.

03 Fell over "naturally;" removed from the site.

04 Cut down or pushed over; still present.

SNAG "GONE"

05 Cut down or pushed over; removed from the site.

06 D.b.h. and/or height no longer meet minimum for tally (snag "shrank" to less than 12.5 cm. d.b.h. or less than 2 meters tall).

10 No cavity or den present.

SNAG GREW "IN" AND DIED

11 Cavity or den present.

3. **Harvested trees:** Tree history is 8. Record a 2-digit for trees tallied or reconstructed as live and ≥ 12.5 cm d.b.h. at Oc3 that are now harvested.

<u>Code</u>	<u>Harvest use</u>
01	Harvested for industrial supply
02	Harvested for firewood or local use
03	Harvested for incidental reasons

Definitions of harvest use:

Harvested for industrial supply means the tree was harvested for industrial roundwood or chips. The tree was not used for firewood or for products manufactured and used by "do-it-yourselfers", often on the property of origin for improvements such as fences, buildings and bridges. The tree was marketed and transported from the property of origin to wood-using plant or export operation.

Harvested for firewood or local use means the tree was harvested for firewood, or for wood products manufactured and used locally by "do-it-yourselfers", often on the ownership of origin, for improvements such as fences, buildings and bridges. The tree was not marketed and transported to a wood-processing plant or export operation.

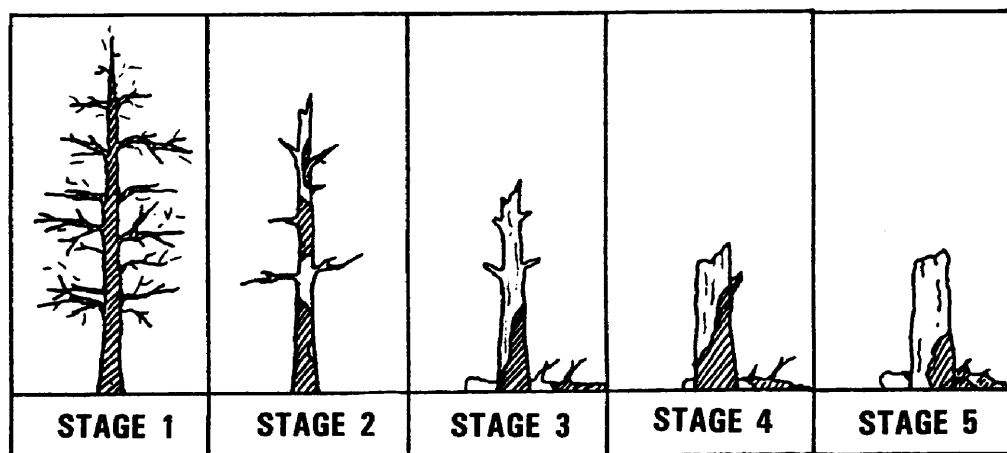
Harvested for incidental reasons means the tree was harvested (1) as an isolated removal in an otherwise undisturbed stand or (2) as part of a harvest activity in an adjacent stand condition that resulted in the removal of one or more tally trees.

Item 24--Oc3 snag decay class

A 1-digit code printed/downloaded for snags sampled at Oc3. If still a snag ≥ 12.5 cm. d.b.h. and ≥ 2 meters tall, revise Oc3 decay class if obviously incorrect. Do not reconstruct for snags sampled for the first time at Oc4. Decay classes are listed in the next item.

Item 26--Oc4 snag decay class

A 1-digit code entered for snags ≥ 12.5 cm. d.b.h. and ≥ 2 meters tall at Oc4. It is unlikely that decay class 5 will apply to snags; by the time a snag has reached decay class 5, it will have toppled over or have become less than 2 meters tall.



Characteristics of Douglas-fir snags by decay class¹

Snag characteristics						
Decay Stage (code)	Limbs and Branches	Top	% Bark Remaining	Sapwood Presence	Sapwood Condition	Heartwood Condition
1	All present	Pointed	100	Intact	Sound, incipient decay, hard, original color	Sound, hard, original color
2	Few limbs, no fine branches	Broken	Variable	Sloughing	Advanced decay, fibrous, firm to soft, light brown	Sound at base, incipient decay in outer edge of upper bole, hard, light to reddish brown
3	Limb stubs	Broken	Variable	Sloughing	Fibrous, soft, light to reddish brown	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, reddish brown
4	Few or no stubs	Broken	Variable	Sloughing	Cubical, soft, reddish to dark brown	Advanced decay at base, sloughing from upper bole, fibrous to cubical, soft, dark reddish brown
5	None	Broken	Less than 20	Gone	Gone	Sloughing, cubical, soft, dark brown, <u>OR</u> fibrous, very soft, dark reddish brown, encased in hardened shell

¹ Characteristics are for Douglas-fir. Snags for other species may vary somewhat; use this table as a guide.

Tree record comments

Use the following codes to record comments pertaining to a tree record.

Guide to Husky tree record comment codes:

<u>Comment</u>	<u>Code</u>
Basal scar	1
Extrapolated age	2
Half diam method	3
Stump	4
D-nail not found	5
Leaning tree	6
Topout; dead top	7
Forked top	8
Crook or sweep	9

X. COARSE WOODY DEBRIS

TABLE OF CONTENTS

X. COARSE WOODY DEBRIS	129
A. Introduction.....	129
B. Definition of coarse woody debris.....	129
C. Sampling methods.....	129
D. Locating and establishing line transects	130
E. Tally rules for coarse woody debris	130
F. Tally rules for CWD when the piece lays across two or more condition classes:	133
G. Marking CWD.....	135
H. Recording procedures.....	135
I. Individual data items	136
Item 1--Subplot number (PT)	136
Item 2--Transect (T).....	136
Item 3--Condition Class (C)	136
Item 4--CWD slope distance (CWD DIST)	136
Item 5--Species (SPC).....	136
Item 6--Diameter at point of intersection (TRAN DIAM)	136
Item 7--Diameter at the small end (SML DIAM)	137
Item 8--Diameter at the large end (LRG DIAM)	137
Item 9--Total length (TOTAL LENGTH)	137
Item 10--Condition class length (COND LENGTH)	137
Item 11--Decay class (DECAY CLASS)	138
Item 12--Number of other pieces contacted (# CONT)	138
Item 13--Orientation on slope (ORNT)	139
Item 14--Is the piece hollow? (HOL?).....	139
Item 15--Transect condition class distance (TC DIST)	140
Item 16--Slope percent (SLP PCT)	140
J. Sampling Residue Piles.....	140
Selection instructions.....	140
Individual data items:.....	141
Item 1--Subplot number (SUB PL)	141
Item 2--Condition class (CC).....	141
Item 3--Pile azimuth (PILE AZM)	141
Item 4--Shape (SHP)	142
Item 5 and 6--Length 1 and Length 2 (LNG1, LNG2).....	142
Item 7 and 8--Width 1 and Width 2 (WID1, WID2).....	142
Item 9 and 10--Height 1 and Height 2 (HT1, HT2).....	142

X. COARSE WOODY DEBRIS

A. Introduction

Coarse woody debris (CWD) is dead, downed pieces of wood. CWD, like live trees, snags, stumps, nontree vegetation and litter, is a component of vegetative structural diversity. Wildlife biologists, mycologists, ecologists, foresters and others are interested in CWD because it relates to:

- wildlife habitats
- vegetation diversity
- storage and cycling of nutrients and water
- carbon sequestration, which relates to atmospheric conditions
- fire behavior

Knowledge about the nature and function of CWD is incomplete. Most studies have been conducted in mature and old-growth forests that originated naturally after fire. Little is known about the characteristics of woody debris in managed forest stands and in stands that originated after logging: stands that are present on most of the non-Federally-owned forest that PRIME inventories in western Oregon.

B. Definition of coarse woody debris

In this inventory, CWD includes downed, dead tree and shrub boles, limbs, and other woody pieces that are severed from their original source of growth or uprooted (no longer self-supported by their roots). It also includes other non-machine processed roundwood such as fence posts and cabin logs. CWD does not include:

1. Standing dead trees or shrubs self-supported by their roots.
2. Trees showing any sign of life.
3. Stumps that are rooted in the ground (i.e. not uprooted).
4. Dead foliage, bark or other non-woody pieces that are not an integral part of a bole or limb. (Bark attached to a portion of a piece is an integral part).
5. Roots or main bole below the root collar.

C. Sampling methods

Two sampling methods are used to sample CWD. Normally, line intersect sampling is used. In this method, transects are established, and downed pieces meeting specified dimensions and criteria are selected if their central axis is intersected by the transect. Special procedures apply when the piece lays across a condition class boundary.

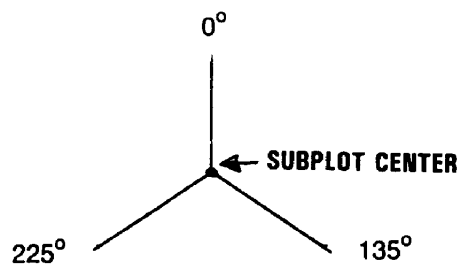
The line intersect method is not practical for sampling CWD pieces that are part of machine-piled slash piles or windrows, or that are part of log "jumbles" at the bottom of steep-sided ravines in which individual pieces are absolutely impossible to tally separately. In these cases, a pile is sampled according to instructions titled "Sampling residue piles" on page 140.

D. Locating and establishing line transects

Three transects are established on a subplot on the standard layout (##, N, and C subplots) if the subplot meets **ALL** of the following criteria:

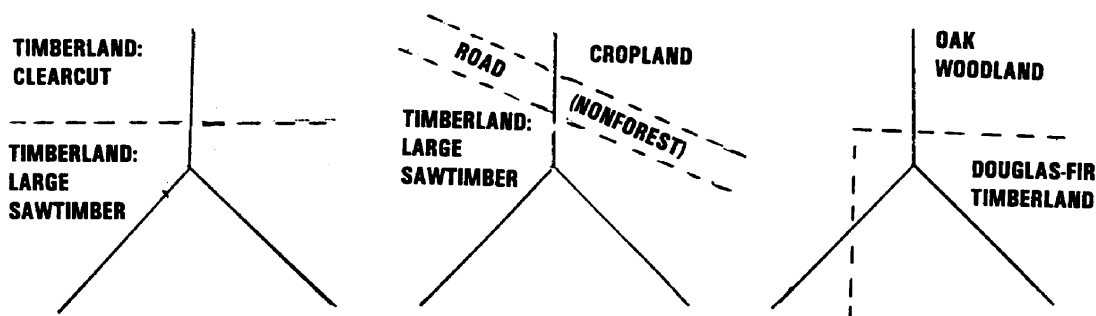
1. At least one condition class mapped on the subplot's 16.95-meter fixed-radius plot is classified as forest land (GLC 20-50) and has a sample kind of 1 or 2, **AND**
2. The subplot center is in inventoried area.

Each transect originates at the subplot center and extends 16.95 meters horizontal distance. The azimuths from subplot center to the end of the three transects are, respectively, 0, 135, and 225 degrees. It is extremely important to lay out the transect in a straight line to avoid biasing the selection of pieces and to allow the remeasuring the transect lines and tally pieces for change. The transects also will be used to sample overstory tree cover (see page 145).



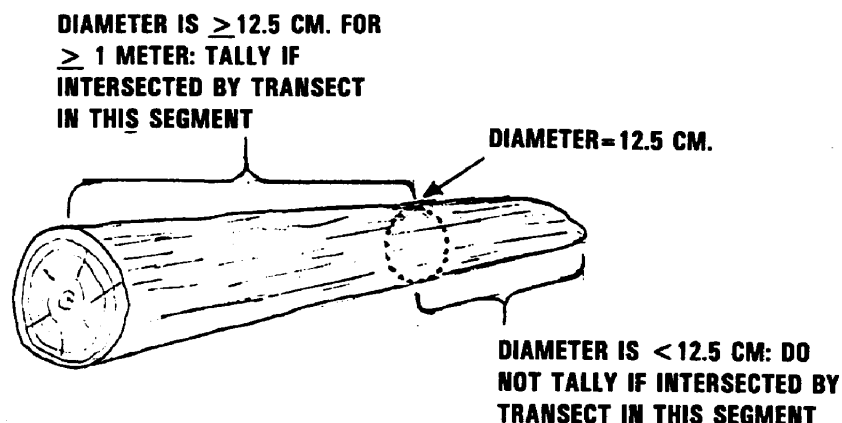
Line transect layout on a subplot

On subplots where a transect intersects a boundary between condition classes, the transect continues across the boundary into the adjacent class. Individual pieces of CWD intersected by a transect are tallied if they meet the tally rules specified in the next two sections (F and G).

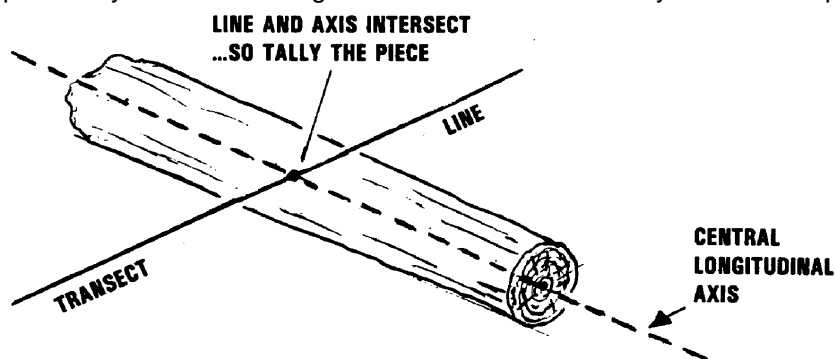


E. Tally rules for coarse woody debris

1. Tally a piece only if it is at least 12.5 cm. in diameter at the point of intersection with the transect plane.
2. Tally a piece only if it is at least one meter in length and 12.5 cm. or more in diameter along that length. See diagram on next page.

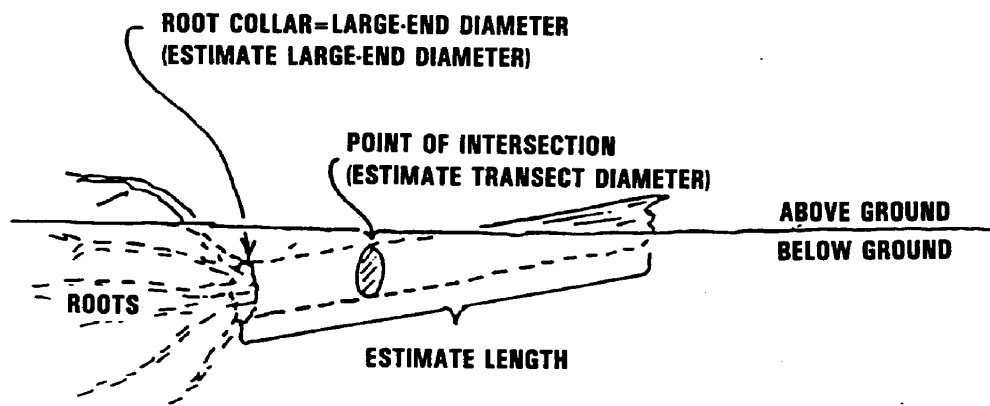


3. Tally a piece only if 1) the intersection of the piece with the transect plane, **and** 2) the midpoint of the piece's length between small and large end diameters (Items 7 and 8 on page 149) are in the same condition class. If this condition class is nonforest or out-of-inventory, do not tally the piece.
4. Tally a piece only if its central longitudinal axis is intersected by the transect plane.

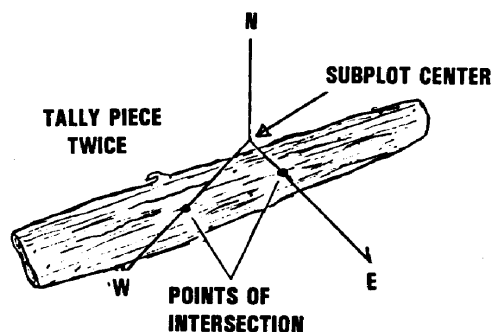
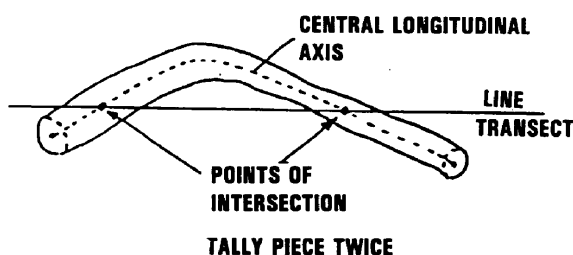


5. Tally pieces created by natural causes (examples: natural breakage or uprooting) or by human activities such as cutting only if not systematically machine-piled. Do not record pieces that are part of machine-piled slash piles or windrows, or that are part of a log "jumble" at the bottom of a steep-sided ravine in which individual pieces are absolutely impossible to tally separately. Instead, sample these piles according to instructions on "Sampling residue piles" (see page 140). A slash pile or windrow consists of broken logs, limbs, and other vegetative debris.
6. Tally only those portions of pieces that are decay class 1, 2, 3, or 4. Do not tally pieces or segments of pieces that are decay class 5. Pieces in decay class 5 are not tallied due to the difficulty in defining pieces in this category (the entire ground surface in some areas seems to be decay class 5 material) and the subjectivity in measuring them. If a piece has segments that are decay classes 1, 2, 3, or 4 and decay class 5, consider the decay class 5 segment a break in the piece and treat as two separate pieces.

7. Tally a piece regardless of whether the point of intersection occurs on or above the ground, or is buried in the litter, duff, or mineral soil. The only restriction on tallying buried pieces are (1) that the piece must be visible somewhere on or above the ground and (2) that it meets all other criteria for tally.

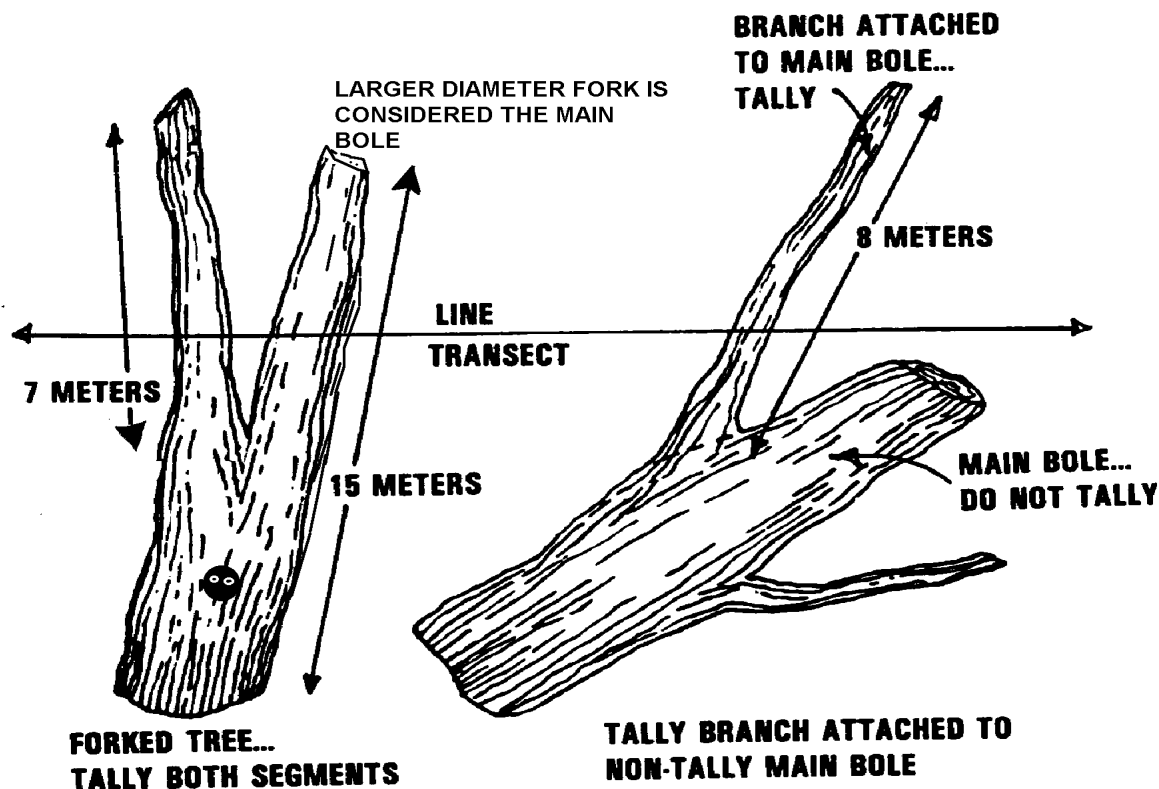


8. If the central longitudinal axis of a piece is intersected more than once on a transect line or if it is intersected by two transect lines, tally the piece each time it is intersected.



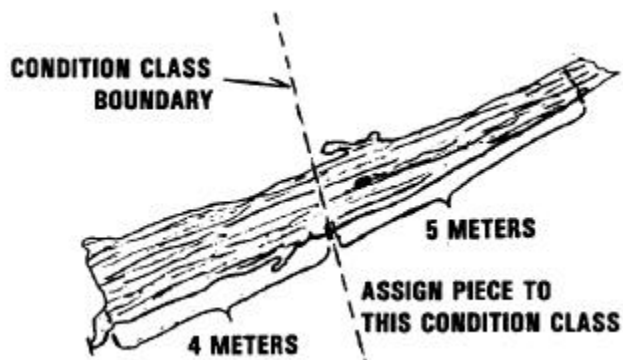
9. Tally a piece only once if the subplot center falls directly on the central longitudinal axis of the piece. Tally the piece on the north transect. Record the CWD Distance as 001.
10. If a piece is fractured across its diameter, and would pull apart at the fracture if pulled from either end, treat it as two separate pieces. If judged that it would not pull apart, tally as one piece. Tally only the piece intersected by the transect line.
11. If a piece is split along its length, would pull apart at the split if pulled from either side, and the split was due to the piece falling or to the impact of another piece or object, then treat it as two separate pieces. If judged that it would not pull apart, tally as one piece. Tally only pieces intersected by the transect line.
12. Tally dead, uprooted trees, snags, and stumps that are no longer supported by their roots from falling over. Do not tally live trees, dead trees, snags or stumps that are leaning, but still supported by their roots from falling over. The crew's judgment on whether or not a tree, snag or stump is self-supported by its roots is final.
13. Do not tally a piece if the transect intersects the piece on the root side of the root collar. Do not tally roots.

14. When the transect crosses forks, branches or boles of one tree (i.e. two or more pieces that are connected), tally each qualifying piece separately. To be tallied, each individual piece must meet the minimum diameter and length requirements. In the case of forked trees, consider the "main bole" to be the piece with the largest diameter at the fork. Characteristics for this fork such as length and decay class should pertain to the entire main bole. For smaller forks, or branches connected to a main bole (even if the main bole is not a tally piece) characteristics pertain only to that portion of the piece up to the point where it attaches to the main bole.

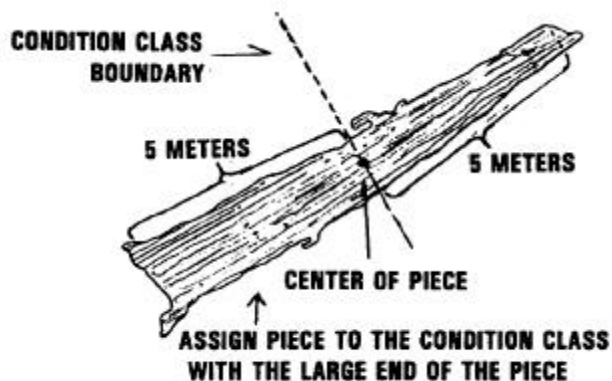


F. Tally rules for CWD when the piece lays across two or more condition classes:

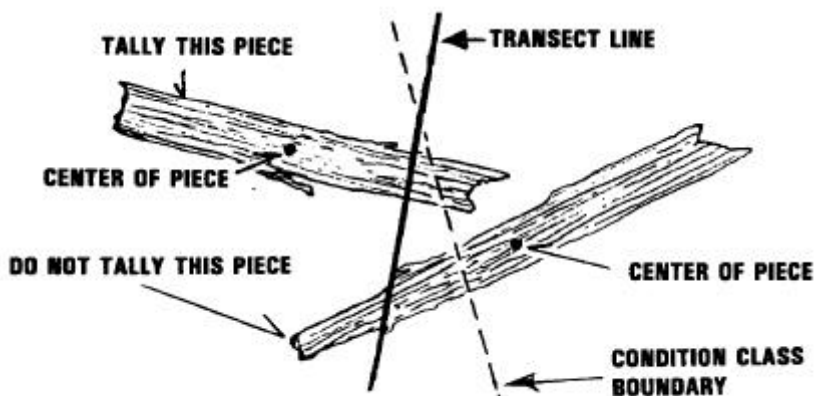
1. A piece is assigned to the condition class that contains the midpoint of the piece's length between small and large end diameters (Item 7 and 8 on page 149). Do not tally the piece if its midpoint is in a condition class that is nonforest or out-of-inventory.



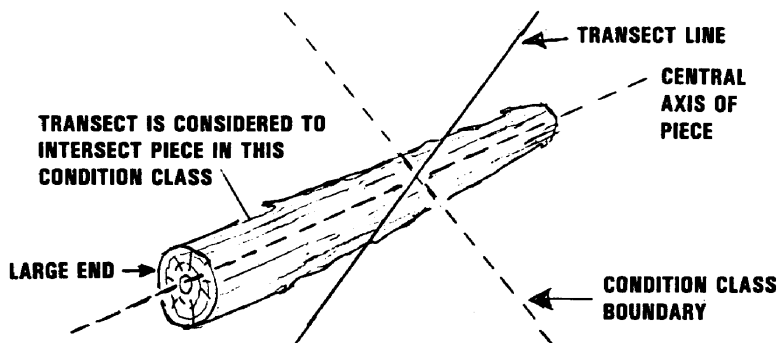
2. If the condition class boundary crosses a piece at the midpoint of the piece's length between small and large end diameters (Item 7 and 8), assign the piece to the condition class that contains the large end of the piece; if its large end is in a condition class that is nonforest or out-of-inventory, do not tally the piece.



3. Tally a piece only if the transect plane intersects the piece in the condition class to which the piece is assigned. (The midpoint of the piece's length between small and large end diameter (Items 7 and 8) and the point of intersection must both be within the same condition class for the piece to be tallied). Do not tally a piece if its intersection with the transect is in a condition class that is nonforest or out-of-inventory.



4. If a transect intersects a piece on a condition class boundary, the transect will be considered to intersect the piece in the condition class which contains the large end of the piece. Do not tally a piece if its intersection with the transect is in a condition class that is nonforest or out-of-inventory.



G. Marking CWD

If, at the point of intersection, a qualifying piece is decay class 1, 2, or 3, mark the point of intersection on the piece with a nail. Position the nail on top of the piece at the point of intersection with the transect. If possible, drive the nail into the piece so that only about 3 centimeters of the nail is left exposed. Stop driving the nail if the next blow means breaking the piece or seriously disturbing the location of the piece.

H. Recording procedures

Record each piece on a transect as a single line entry, completing the items indicated with "X"s on the CWD tally guide. In addition, on the record of the first piece tallied in each condition class crossed by a transect, enter 1) the slope distance along the transect within the condition class (TC DIST), and 2) the average slope percent (SLP PCT) along the transect within the condition class.

If no pieces are tallied on a transect in a condition class, enter a line with the following data for the condition class: 1) subplot number (SUB PL), 2) transect (T), 3) condition class (C), 4) "000" for species (SPC), 5) slope distance along the transect within the condition class (TC DIST), and 6) average slope percent (SLP PCT) along the transect within the condition class. Do this even for nonforest or out-of-inventory condition classes if crossed by an established transect.

A check on recorded TC slope distance and percents (Items 15 and 16): For each transect, the Husky program will compute the horizontal distance along the transect using the recorded transect slope distance(s) and percent(s). The Husky will inform you if the total computed horizontal distance is under or over 16.95 meters and by how much. If the transect crosses more than one condition class, the total computed horizontal distance will be the sum of horizontal TC distances. Adjust the recorded TC slope distances and/or slope percents until the total computed horizontal distance is 16.95 meters. If recording on paper, do this adjustment manually with a calculator.

CWD TALLY GUIDE

SUB	CWD			TRAN	SML	LRG	TOTAL	COND	DECAY	# of				TC	SLP
PL	T	C	DIST	SPC	DIAM	DIAM	LENGTH	LENGTH	CLASS	CONT	ORNT	HOL?	DIST	PCT	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
			(DM)		(MM)	(MM)	(MM)	(M)	(M)					(DM)	
XX	X	X	XXX	XXX	XXXX	XXXX	XXXX	XX	XX	X	XX	X	X	aaa	bb

a Transect condition class distance is recorded only on the first record entered for each condition class on a transect.

b Transect condition class slope is recorded only on the first record entered for each condition class on a transect.

I. Individual data items

Item 1--Subplot number (PT)

Record a 2-character code indicating the subplot center from which the transect originates.

Item 2--Transect (T)

Record a 1-character code indicating the transect on which the piece is sampled. The codes are:

Code	Definition
N	Transect extends 0 degrees from subplot center.
E	Transect extends 135 degrees from subplot center
W	Transect extends 225 degrees from subplot center

Item 3--Condition Class (C)

Record a 1-digit code indicating the condition class to the piece is assigned.

Item 4--CWD slope distance (CWD DIST)

Record a 3-digit code indicating the slope distance from the subplot center to the point where the transect intersects the longitudinal center of the piece. Measure and record to the nearest decimeter. CWD slope distance will be used in locate the piece for remeasurement in future inventories.

If two or more pieces have the same slope distances, record the top piece first.

Item 5--Species (SPC)

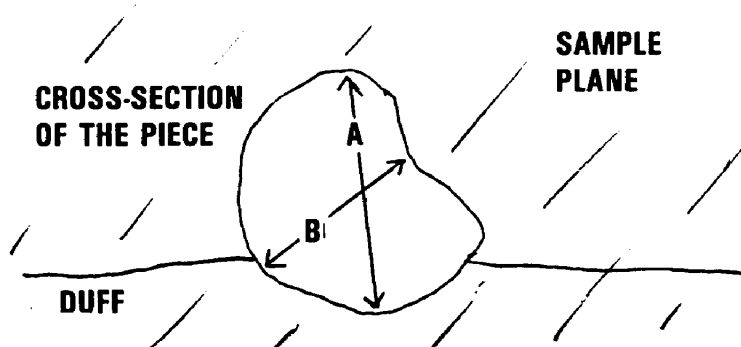
Record a 3-digit code indicating the species of the piece. Species codes are the same as those used for trackable trees (see page 101).

Species identification may be uncertain for some pieces. Make an educated guess. The piece's bark (either attached or sloughed and laying beside the piece), branching pattern (if the branches are still present), or heartwood smell (particularly if cedars, Douglas-fir, or western hemlock) may provide clues. Observe the tree species currently site. On remeasurement plots, see what tree species were tallied in past inventories. An educated guess is preferable to using the unknown species code (999).

Item 6--Diameter at point of intersection (TRAN DIAM)

Record a 4-digit code indicating the piece's diameter at the point where the transect intersects the longitudinal center of the piece. The diameter is recorded in millimeters but can be estimated to the nearest centimeter. Measurement is required when the diameter is within 2 centimeters of 12.5 cm.

For pieces that are not round in cross-section because of missing chunks of wood or due to "settling" due to decay, measure the diameter if possible. If not possible, estimate the longest and shortest axis of the cross-section ("A" and "B" in the diagram below). Record the average of these two estimates as the diameter. This technique applies to transect, small-end, and large-end diameters.



Item 7--Diameter at the small end (SML DIAM)

Record a 4-digit code indicating the diameter at the piece's small end. The diameter is recorded in millimeters but can be estimated to the nearest centimeter. The small end diameter occurs either at 1) the small diameter end of the piece if the small diameter end is ≥ 12.5 cm or 2) at the point where the piece tapers down to 12.5 cm. in diameter.

Item 8--Diameter at the large end (LRG DIAM)

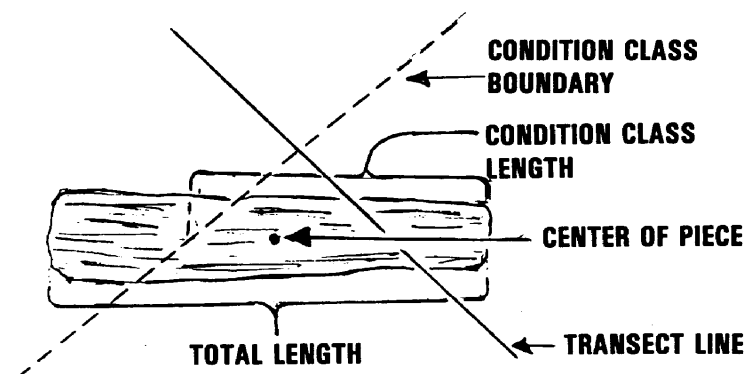
Record a 4-digit code indicating the diameter at the piece's large end. The diameter is recorded in millimeters but can be estimated to the nearest centimeter. The large end will occur either at a broken or sawn end, at a fracture, or at the root collar.

Item 9--Total length (TOTAL LENGTH)

Record a 2-digit code indicating the total length of the piece. Total length is the length of the piece that lies between the piece's recorded small and large end diameters (Items 7 and 8). Estimate and record to the nearest meter.

Item 10--Condition class length (COND LENGTH)

Record a 2-digit code indicating the length of the portion of the piece's recorded total length (Item 9) that lies within the condition class to which the piece is assigned (Item 3). Estimate and record to the nearest meter. When total length is entirely in one condition class, condition class and total length are the same.



Item 11--Decay class (DECAY CLASS)

Record a 1-digit code indicating the decay class of the piece. Code the decay class which predominates along the recorded total length (Item 9) of the piece. Do not tally decay class 5 pieces. When tallying a piece, the sampled portion ends where the decay class 5 begins. Use the above below as a guide to decay class for CWD: (Decay class descriptions for snags are not applicable for CWD).

Decay Class	Structural Integrity	Texture of Rotten Portions	Color of Wood	Invading Roots	Branches and Twigs
1	Sound	Intact, no rot; conks of stem decay conks absent	Original color	Absent	If branches are present, fine twigs are still attached and have tight bark
2	Sound	Mostly intact; sapwood partly soft (starting to decay) but can't be pulled apart by hand	Original color	Absent	If branches are present, many fine twigs are gone and remaining fine twigs have peeling bark
3	Heartwood sound; piece supports its own weight	Hard, large pieces; sapwood can be pulled apart by hand	Reddish-brown or original color	Sapwood only	Branch stubs will not pull out
4	Heartwood rotten; piece does not support its own weight, but maintains its shape	Soft, small blocky pieces; metal pin can be pushed into heartwood	Reddish or light brown	Throughout	Branch stubs pull out
5	None, piece no longer maintains its shape, it spreads out on ground	Soft; powdery when dry	Red-brown to dark brown	Throughout	Branch stubs and pitch pockets have usually rotted down

The characteristics of down logs by decay class are summarized in the above tabulation.

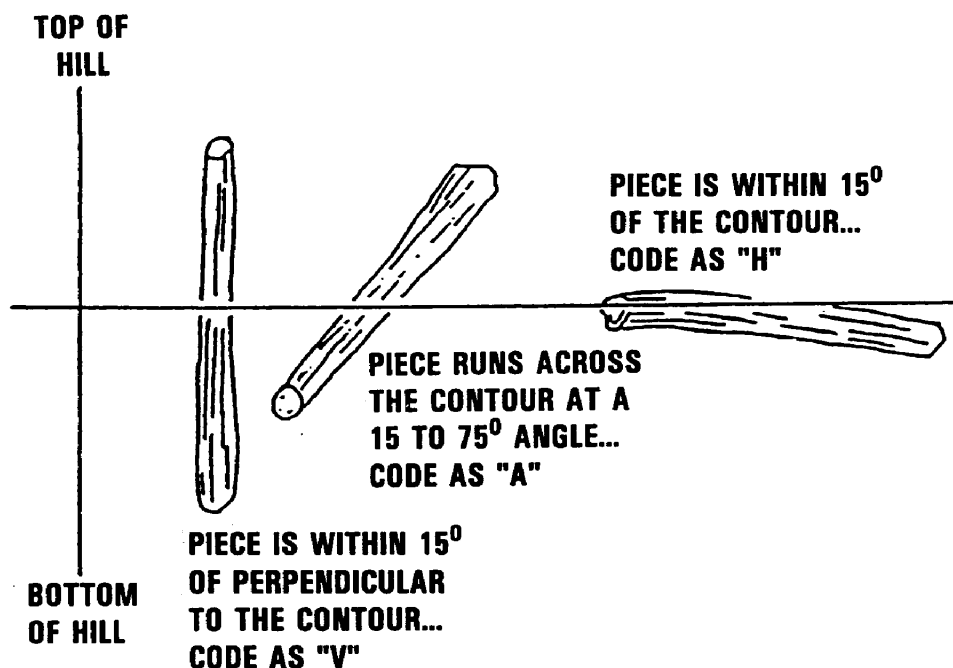
Item 12--Number of other pieces contacted (# CONT)

Record a 2-digit code indicating the number of other pieces in actual physical contact with the tallied piece. These contacts can be in condition classes other than the condition class to which the tally piece is assigned. Count only those pieces in contact with the segment of the tallied piece defined by the recorded total length (Item 9). Count only those pieces that would qualify as tally pieces (≥ 1 meter long, 12.5 cm minimum diameter along the length, and decay class 1, 2, 3, or 4).

Item 13--Orientation on slope (ORNT)

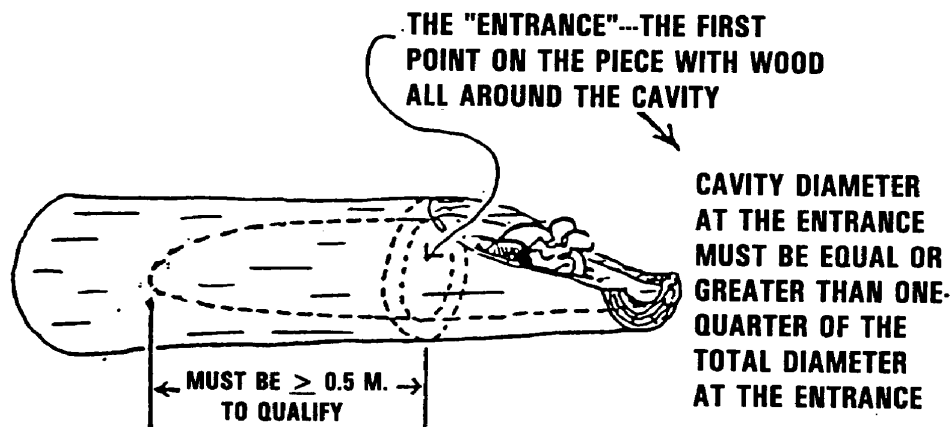
Record a 1-letter code indicating the orientation of the piece on the slope. If the piece is suspended above the ground, select the code which best estimates the orientation if the piece were on the ground.

Code	Orientation	Definition
H	Horizontal	Piece is oriented within 15 degrees of the contour.
V	Vertical	Piece is oriented within 15 degrees of perpendicular to the contour.
A	Across	Piece is oriented between vertical and horizontal.
F	Flat	Piece is on flat ground ($\leq 10\%$ slope).

**Item 14--Is the piece hollow? (HOL?)**

Record a 1-letter code indicating whether the piece is hollow.

Code	Definition
Y	A piece is considered hollow if a cavity extends at least 0.5 meters along the central longitudinal axis of the piece, and the diameter of the entrance to the cavity is at least 1/4 of the diameter of the piece where the entrance occurs. The entrance occurs at the point where the circumference of the cavity is whole -- the point where wood is present completely around the circumference of the cavity. The length of the cavity begins at this point
N	Does not meet criteria for hollow



Item 15--Transect condition class distance (TC DIST)

Record a 3-digit code indicating the measured slope distance along the transect in a condition class. When only one condition class is present on a transect, slope distance is the distance from subplot center to the end of the horizontal 16.95-meter transect. When the transect crosses two or more condition classes, slope distances along the transect are measured and recorded for each condition class.

Item 16--Slope percent (SLP PCT)

Record a 2-digit code indicating the slope percent along the transect in each condition class. Measure to the nearest 5%. When only one condition class is present on a transect, slope percent is the average slope percent along the entire transect. When the transect crosses two or more condition classes, the average slope percent along the transect are measured and recorded for each condition class.

J. Sampling Residue Piles

The line transect method is not practical when sampling CWD within piles and windrows. Piles and windrows will be sampled on the 16.95-meter fixed-radius plot of subplots established on the standard layout. Sample piles and windrows regardless of whether they are intersected by a transect.

Piles and windrows created directly by human activity and log piles at the bottom of steep-sided ravines in which individual pieces are absolutely impossible to tally separately are candidates for sampling using the following instructions. CWD in piles created by windthrow, landslides, fires, and other natural causes should be tallied using line transects unless it would be physically impossible to measure the pieces in the natural pile.

Selection instructions

For a pile to be tallied, **all** of the following criteria must be met;

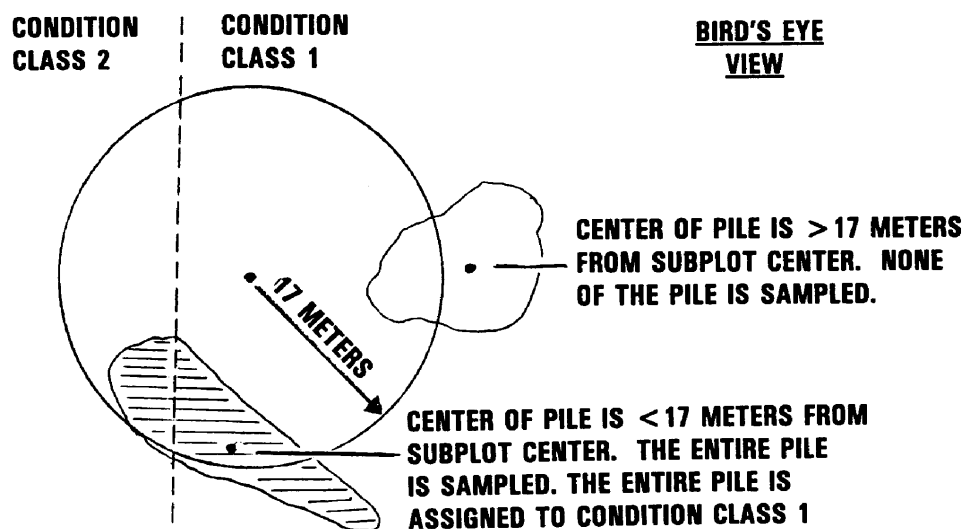
- The pile's center must be within 16.95 horizontal meters of subplot center,
- the pile's center must be in a forest condition class in inventoried area, and
- the subplot center must be in inventoried area.
- more than 50% of the pieces meet the size and length criteria used for tallying individual pieces (see Item E--"Tally rules for coarse woody debris" on page 130)

The pile is assigned to the condition class in which pile center lies.

Apply the following steps to determine the center of a pile or windrow:

1. Determine the longest axis of a pile.
2. Determine the midpoint of this axis.
3. Project a line through this midpoint that is perpendicular to the axis determined in step a.
4. Determine the midpoint of the segment of this projected line that crosses the pile

Piles that cross the 16.95-meter fixed-radius plot boundary: If the center of a pile is within 16.95 horizontal meters of subplot center, tally the pile, recording the dimensions of the entire pile even if part of the pile is beyond 16.95 meters. If the center of a pile is more than 16.95 horizontal meters of subplot center, do not tally the pile or any portion of the pile.



Individual data items:

PILE TALLY GUIDE

	SUB		PILE							
	PL	CC	AZM	SHP	LNG1	LNG2	WID1	WID2	HT1	HT2
ITEM	1	2	3	4	5	6	7	8	9	10
					(M)	(M)	(M)	(M)	(M)	(M)
	XX	X	XXX	X	XX	XX	XX	XX	XX	XX

Item 1--Subplot number (SUB PL)

Record a 2-character code indicating the subplot number.

Item 2--Condition class (CC)

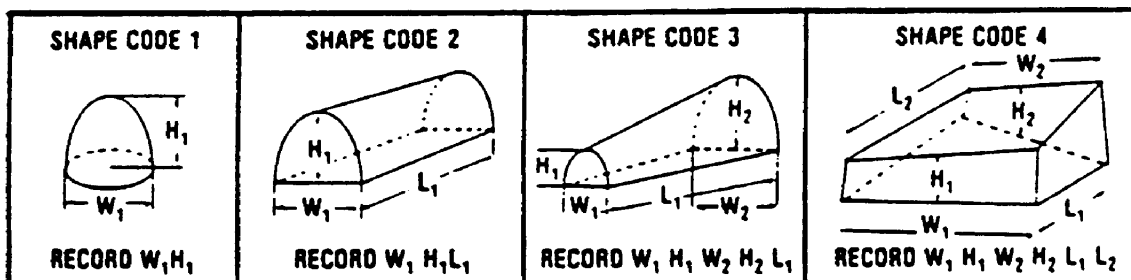
Record a 1-digit code indicating the condition class to which the pile is assigned.

Item 3--Pile azimuth (PILE AZM)

Record a 3-digit code indicating the azimuth from the subplot center to the pile. This azimuth centers on the pile so that it can be relocated.

Item 4--Shape (SHP)

Record a 1-digit code indicating the shape of the pile. Determine which of the 4 shapes diagrammed below most resembles the pile and record the dimensions. Pile dimensions should be jocularly smoothed out when making estimates. Average the unevenness of protruding pieces.



Item 5 and 6--Length 1 and Length 2 (LNG1, LNG2)

Record a 2-digit code indicating the length of the sides of the pile. Estimate to the nearest meter. Length 1 may often equal Length 2.

Item 7 and 8--Width 1 and Width 2 (WID1, WID2)

Record a 2-digit code indicating the width of the sides of the pile. Estimate to the nearest meter. Width 1 may often equal Width 2.

Item 9 and 10--Height 1 and Height 2 (HT1, HT2)

Record a 2-digit code indicating the height of either end of the pile. Estimate to the nearest meter. Height 1 may often equal Height 2.

XI. TREE COVER

TABLE OF CONTENTS

XI. TREE COVER.....	145
A. Introduction.....	145
B. General instructions.....	145
C. Tally rules.....	146
D. Tree cover data	149
Item 1--Subplot number (SUB PLT)	149
Item 2--Transect line (T)	149
Item 3--Start of line (S)	149
Item 4--Condition class (C)	149
Item 5--Species (SPC).....	149
Item 6--Canopy Layer (LAYER)	149
Item 7--Beginning distance (DIST1).....	149
Item 8--Ending distance (DIST2).....	150
E. Summary for canopy layers	150

XI. TREE COVER

A. Introduction

Tree canopy closure, or tree cover, is a widely used attribute of forest stands. Ground-based estimates of tree cover are used to estimate wildlife habitat quality (suitability for nesting, hiding and foraging), timber volume, biomass, plant communities, stand structure (including overstory-understory vegetation relationships), forage production, the extent of forest pests and precipitation interception. Ground-based estimates of tree cover also are used to develop and validate classification algorithms that are used to estimate the extent and distribution of tree cover from remote-sensed imagery.

In past inventories, PRIME has not generated ground-based estimates of tree cover. Instead, users of PRIME data have had to rely either on estimates that were obtained by ocular estimation or have had to assume a one-to-one relationship between the combined stocking contributions of tallied trees and the percentage of total cover present. Neither approach provides estimates that are satisfactorily accurate, and the latter is particularly unreliable in very young stands which, even when fully or excessively stocked with trees, typically have very low percentages of total tree cover.

To gain better estimates of tree cover, we are sampling tree cover using line intercept sampling. Data will be collected so that cover estimates can be made by tree species and canopy layer within each forest condition class recognized on a plot. Line intercept sampling is a different technique than line intersect sampling which is used to sample coarse woody debris (CWD).

B. General instructions

We will sample the cover of live trees ≥ 1.4 meters tall using the line intercept method. On the same line transects used for sampling CWD, we will enter a record whenever a tree's crown intercepts a transect line.

Sample for tree cover on any subplot on the standard layout (##, N, and C subplots) that meets **BOTH** of the following criteria:

1. At least one condition class mapped on the subplot's 16.95-meter fixed-radius plot is classified as forest land (GLC 20-49) and has a sample kind of 1 or 2, **AND**
2. The subplot center is in inventoried area.

If these criteria are met, tree cover is sampled on all three transects in all forest and nonforest condition classes except for transect segments that are in out-of-inventory area. If the 16.95-meter fixed-radius plot on one of these subplots is entirely of nonforest condition classes, tree cover is not sampled on the subplot.

All condition classes on each transect require a line entry. This includes condition classes that are out-of-inventory. If no cover is tallied within a condition class crossed by a transect, enter a line with the following data for the condition class: 1) subplot number (SUB PL), 2) transect (T), 3) condition class (C), and 4) "000" for species (SPC).

Use the same three 16.95-meter line transects used to sample CWD to sample tree cover. Each 16.95-meter transect line originates at the subplot center. The azimuths from subplot center to the end of the three lines are, respectively, 0, 135, and 225 degrees. The 16.95-meter distance is horizontal distance. It is extremely important to lay out the transect in a straight line to avoid biasing estimates of cover.

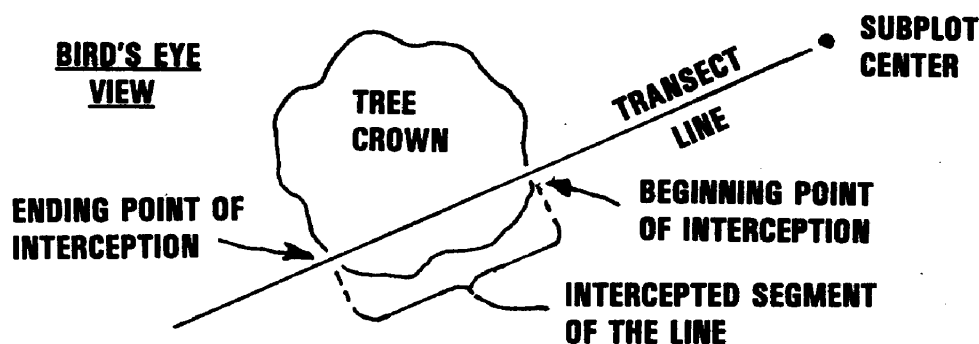
When a transect line crosses a border between two condition classes, the line and the sampling of cover continues beyond the border to the end of the line at 16.95 meters (horizontal distance).

Total slope distance for the 16.95-meter line, slope percent, and distances to condition class borders that intercept the line, are collected as part of CWD procedures. These data are not recorded again as part of tree cover procedures.

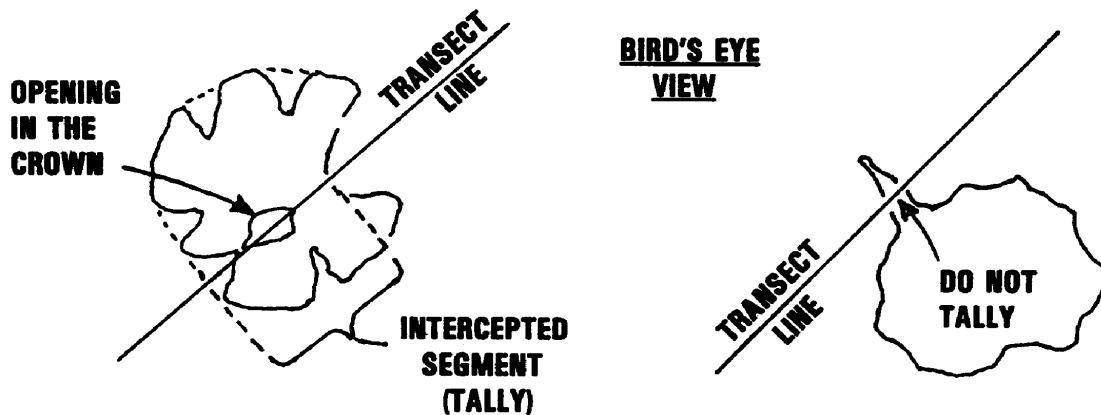
C. Tally rules

The following rules apply;

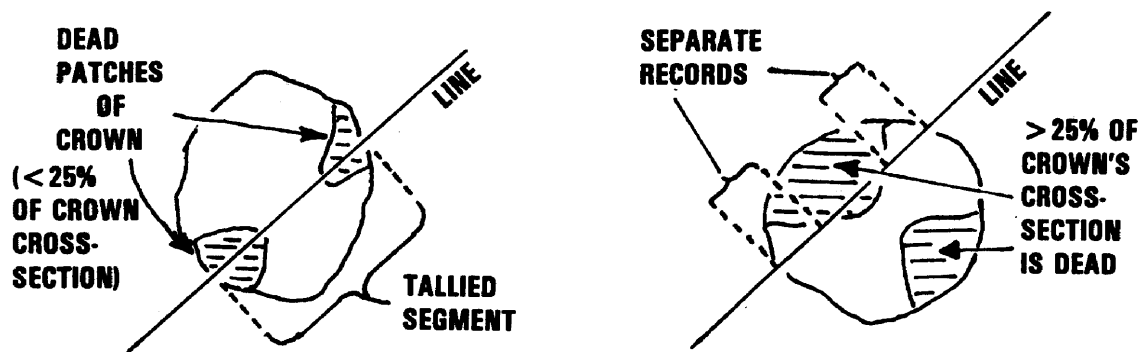
1. Tally the intercepted portion of a tree's crown only if the tree is:
 - a) alive
 - b) a species recognized as a tree in the inventory (see page 101), and
 - c) ≥ 1.37 meters tall.
2. The distance from subplot center at beginning and ending points of interception ("drip line") along the transect line will be recorded for each tallied tree crown. Evaluate all of the crown intercepted for where these points of interception are located, and not just the portion that is more than 1.4 meters above the ground.



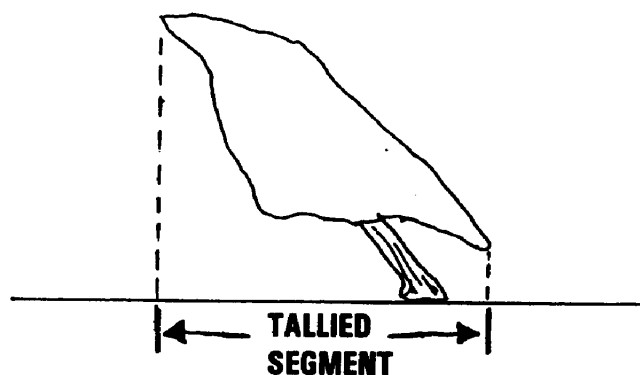
3. The entire "generalized" crown intercepted along a transect line is included as intercepted distance. Minor gaps and openings within the general outline of a crown are included as part of intercepted crown. Do not include branches that protrude beyond the general outline of a crown.



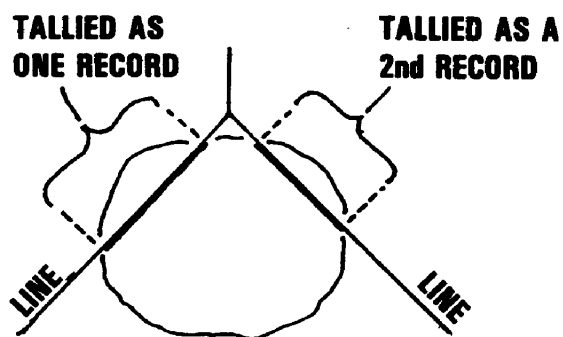
4. Minor areas of dead foliage and branches in a crown are included as intercepted distance. Do not include an area of dead crown if it is ≥ 25 -percent of the crown's cross-sectional area (Two records for the tree may be needed if this occurs).



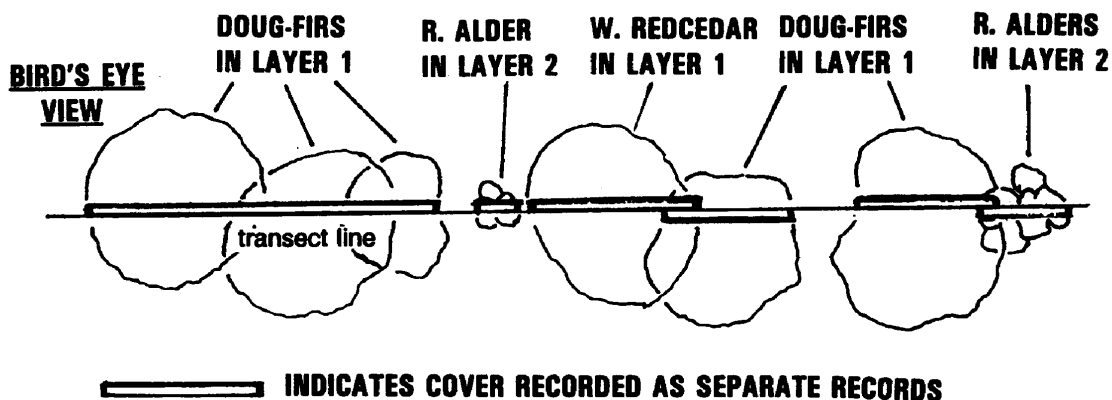
5. The crown coverage of a leaning tree is not "corrected" for the lean.



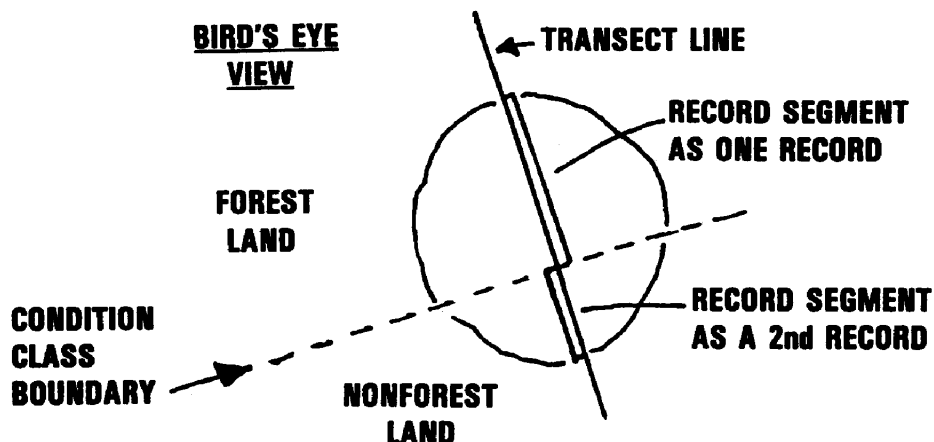
6. A crown intercepted by more than one transect line is tallied on each transect line it intercepts.



7. Tree crowns of the same species and layer which form a segment of unbroken cover can be recorded as one record. Segments of different species and layers are recorded as separate records.



8. Condition class boundaries mapped for the subplot are recognized when sampling canopy cover. Generally, these boundaries follow the edge of tree crowns. However, if a crown segment is divided by a condition class border, two records are entered: one for each segment of the crown intercepted the line in each class.



D. Tree cover data**Tree cover tally guide**

	SUB PLT	T	S	C	SPC	L	DIST1	DIST2
ITEM	1	2	3	4	5	6	7	8
	XX	X	X	X	XXX	X	(dcm) XXX	(dcm) XXX

Item 1--Subplot number (SUB PLT)

Record a 2-character code indicating the subplot center from which the transect line originates. The subplot number is the same as for CWD transect lines.

Item 2--Transect line (T)

Record a 1-character code. The character indicates which transect line intercepts a segment record. The codes are:

Code	Definition
N	Transect extends 0 degrees from subplot center.
E	Transect extends 135 degrees from subplot center.
W	Transect extends 225 degrees from subplot center.

Item 3--Start of line (S)

Record a one-digit code on the first record tallied on a transect. Record a "0" if beginning and ending distances on the transect are recorded with the zero-end of the measuring tape located at subplot center. Record a "1" if the zero-end of the measuring tape is located 16.95-meters (horizontal distance) from subplot center.

Start of line merely indicates which end of the measuring tape is physically at the subplot center. It does NOT indicate if beginning distances are larger/smaller than ending distances, or if crown segments are measured with the cruiser working towards/away from the subplot center.

Item 4--Condition class (C)

A one-digit code. Record the number of the condition class in which a record is tallied.

Item 5--Species (SPC)

A 3-digit code. Enter the tree species code of the tree whose crown the record represents. Species codes are the same as those used for trackable trees (page 101).

Item 6--Canopy Layer (LAYER)

A 1-digit code. Record canopy layer for each record. You should complete "Summary for canopy layers" prior to coding this item for individual crown canopy records in a condition class. See page 150.

Item 7--Beginning distance (DIST1)

A 3-digit code. Record the slope distance along the transect line where the line first intercepts the crown. This point occurs where the edge of the crown is perpendicularly above the line. Record to the nearest decimeter.

Item 8--Ending distance (DIST2)

A 3-digit code. Record the slope distance along the transect line where the line last intercepts the crown. This point occurs where the edge of the crown is perpendicularly above the line. Record to the nearest decimeter.

E. Summary for canopy layers

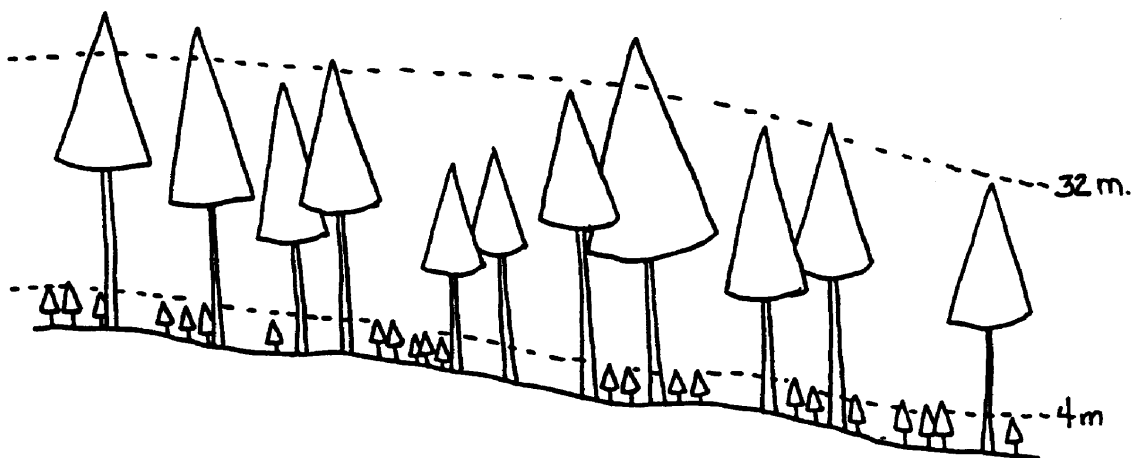
Determine what canopy layers are present within each forest condition class. This determined by the condition class across the entire plot area. Up to 3 layers can be recognized in a condition class. The average heights of layers in a condition class must differ by at least five meters to be recognized separately; if there is less than 5 meters separation, combine the two prospective layers into one layer (see diagrams below). Layers and their average heights in one recorded condition class do not have to match up with layers and their assigned average heights in other recorded condition classes.

When reasonable, the height for the lowest layer in the condition class should be the same as the height for taller tree seedling layer recorded on the vegetation profile if these layers are, in reality, the same. These two heights may both need to be adjusted to a common value as work proceeds.

In the height layer summary, record by condition class, the layer numbers and the average height of trees in each layer. As you complete the subplots, you may want to adjust these heights to more accurately reflect the heights of the layers within the condition class.

Record layer as a 1-digit code and height as 3-digit code to the nearest decimeter. The tallest layer is always recorded as layer 1. Use three dashes (---) in layer height to void layer records that are not needed, i.e. only one, or two layers, or no layers (no trees) are present in a condition class.

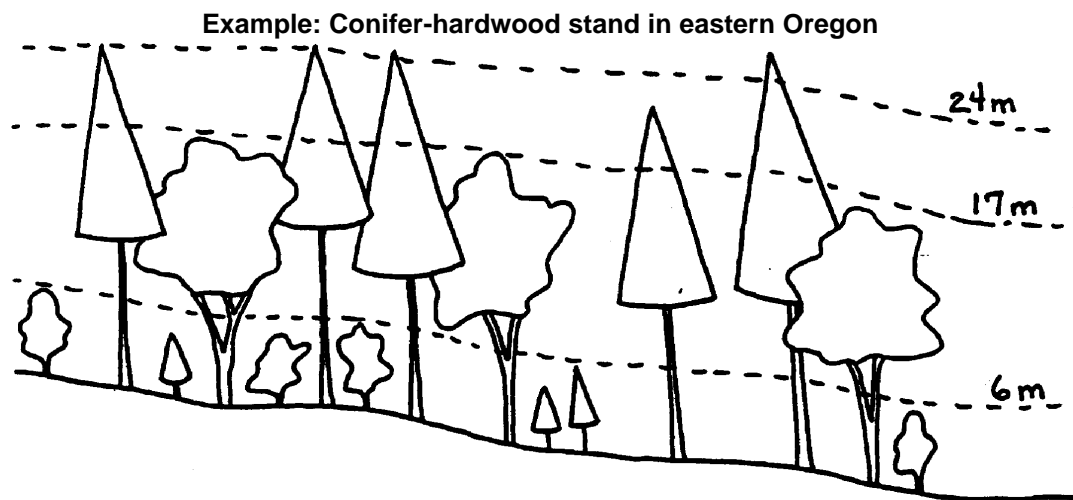
Example: Two-storied stand in eastern Oregon



Height of tree layer 1 = 32 m. = code "320."

Height of tree layer 2 = 4 m. = code "040."

Height of tree layer 3 = nonexistent = record three dashes.



Height of tree layer 1 = 24 m. = code "240."
Height of tree layer 2 = 17 m. = code "170."
Height of tree layer 3 = 6 m. = code "060."

XII. STOCKING SUBPLOTS

TABLE OF CONTENTS

XII. STOCKING SUBPLOTS.....	155
A. General instructions.....	155
B. Locating and numbering stocking subplots.....	155
C. Tree selection.....	158
D. Tree data.....	160
Item 1--Stocking subplot number (Sub pl)	160
Item 2--Condition class (Cc)	160
Item 3--Species (SPC).....	160
Item 4--Diameter (DBH).....	160
Item 5--Height (HT).....	160
Item 6--Breast-high age (BH AGE).....	160
Item 7--Crown ratio (CR).....	160
Item 8--Damaging agent and severity (Agt, S)	160
Item 9--Mistletoe Rating (M)	160
Item 10--Crop tree (CT)	160
E. Inhibiting vegetation.....	161
F. Precommercial thinning on stocking subplots.....	162
G. An exceptional case	162

XII. STOCKING SUBPLOTS

Information on tree stocking is used to estimate stand attributes and opportunities for silvicultural treatment. Adequate assessment of tree stocking within many stands requires a larger fixed-radius plot and more sample subplots than is provided by the standard 5-subplot layout.

A. General instructions

5 temporary stocking subplots are taken in each condition class on a 5-subplot plot that meets the following criteria:

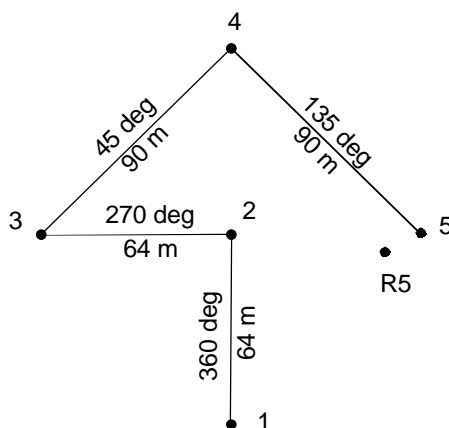
1. There is at least one subplot center on the standard subplot layout that lies within the condition class. That is, the condition class is not a "sliver".
2. The condition class is timberland or other forest-low site (GLC 20 or 49)
3. The condition class is not an "island" <2.5 hectares in area that is surrounded by nonforest condition classes that are all ≥ 35 meters wide.
4. The condition class does not have a sample kind of 3 (a plot which is a single 17-meter fixed-radius vegetation profile plot).

A 5-subplot plot on the standard layout can have two or more condition classes which each require 5 stocking subplots.

B. Locating and numbering stocking subplots

Stocking subplots are located by the following steps:

- 1.) First, take stocking subplots at all standard subplot locations whose subplot centers lie within the condition class and are not in a nonforest inclusion <0.4 hectare in size. Standard stocking subplot locations and their numbers are diagrammed below.
- 2.) If a standard subplot location has a R point associated with it, and the R point is entirely within the condition class being sampled, install the stocking subplot at the R-point location.



3.) Stocking subplots are numbered with a 2-character code; the first character is an "S", and the second, the number of the stocking subplot.

Assign an S and number to each stocking subplot taken at a standard stocking subplot location in the condition class in steps 1 and 2. Do this by giving the lowest "S" number to the lowest numbered subplot location on the diagram within the condition class, the second lowest "S" number to the second lowest numbered stocking subplot location on the diagram within the condition class and so on until all standard stocking plot locations are assigned a "S" number. A example to illustrate steps 1, 2 and 3:



Both condition classes require stocking subplots. Four standard stocking subplot locations are within condition class 1 and one standard stocking subplot location is within condition class 2. They are numbered S1 through S4 in condition class 1 and S1 in condition class 2.

If less than 5 stocking subplots have been taken in the condition class, proceed with step 4.

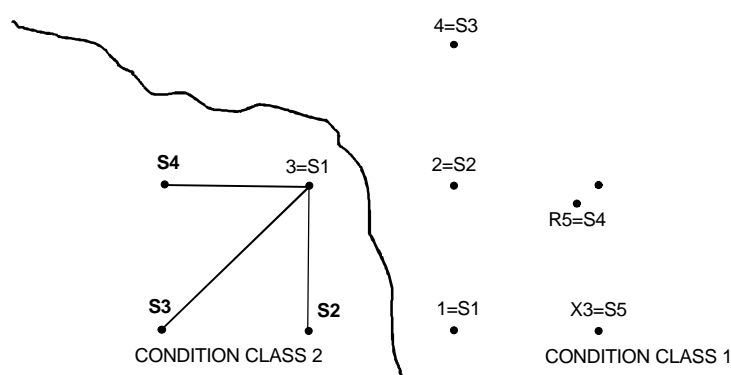
4.) Assign "S" numbers to X subplots in the condition class. Start with the lowest numbered X subplot and proceed until 5 stocking subplots have been taken. Do not use an X subplot with more than one condition class mapped within the 16.95 meter radius boundary unless all other X subplots have been assigned "S" numbers and there are still less than 5 stocking plots taken.



5.) After assigning "S" numbers to stocking subplots on the standard layout and X (substituted) subplots, locate additional stocking subplots whose centers are at locations in the condition class that are not on the standard stocking subplot layout. Do so until 5 subplots have been taken in the condition class. Do so by selecting locations off the highest numbered S subplot already taken; this is done by selecting locations specified by the following schedule if within the condition class; start at north (0°) and proceed clockwise:

Azimuth from the highest numbered "S" stocking subplot	Distance from the highest numbered "S" stocking subplot
0°	64 meters
45°	90 meters
90°	64 meters
135°	90 meters
180°	64 meters
225°	90 meters
270°	64 meters
315°	90 meters

Do not select a location if its subplot center is within 15 meters of a stocking subplot center already taken in the condition class. Do not select a location if its subplot center falls in a nonforest inclusion <0.4 ha.



In condition class 2, S1 is the highest number S subplot assigned in steps 1 to 3. Potential stocking subplot locations are checked at the azimuth and distances listed in step 5. Locations off of S1 in the condition class are at 180° and 64 m., at 225° and 90 m., and at 270° and 64m. These locations are given S numbers clockwise from north: S2 (180°), S3 (225°) and S4 (270°).

6.) If, after step 5, there are still less than 5 stocking subplots taken in the condition class, repeat step 4 at the highest numbered S subplot until 5 stocking subplots have been taken. Repeat as needed to achieve 5 stocking subplots.



S4 is the highest numbered S subplot assigned in step 4. The first potential stocking subplot location (step 4) off of S4 not previously assigned an S number and within condition class 2 is 225° and 90 m. It becomes S5.

7.) Additional instructions for locating temporary stocking subplots:

- a) Move the subplot center of a stocking subplot if a portion of the fixed-radius subplot area (the 5 meter radius around subplot center) falls in another condition class or in a nonforest inclusion <0.4 hectare in area (see page 47). Move away on a line perpendicular to the boundary until stocking subplot center is 5 meters from the class boundary or nonforest inclusion. **Never move any other type of subplot.** Make sure you return to the original stocking subplot center location as the point of departure to the next subplot location.
- a) Mark the subplot center of each stocking plot with flagged stick stuck in the ground. Tie a 1-meter streamer of flagging above subplot center to a limb or whatever is handy. No other referencing is needed.

C. Tree selection

Select all of the trees "in" on each variable radius plot, and up to 20 additional stocking trees on each 5 meter fixed-radius stocking subplot. Record each selected tree as a separate record. Trees are selected in three steps:

Prism Tally: Using the same BAF prism factor used on the standard subplots (BAF 30 or 20 is printed/downloaded in the condition class record and the tree tally record) tally all trees "in" on the variable radius plot that meet the following criteria:

1. Select only live trees ≥ 12.5 cm. d.b.h.
2. Select only trees within 16.95 meters (horizontal distance) from subplot center to the bole center of a tree at d.b.h.
3. Select every other borderline tree.

Fixed Radius Tally:

Step 1: Tally up to 8 trees that meet the following selection criteria:

1. Select only trees <12.5 cm. d.b.h.
2. Select only trees whose bole centers at the ground are within 5 meters (horizontal distance) of subplot center.
3. Select only trees at least 2 meters from any tree tallied on the variable-radius plot, and at least 2 meters away from any other tree tallied in Step 1.
4. Select only trees that at least 15 cm. tall and are established in mineral soil.
5. Select only trees that are expected to live at least 10 more years.
6. Select a tree only if it is not currently overtopped and shaded by another conifer and will not be overtopped and shaded by another conifer before reaching 22.5 cm. d.b.h. This includes overtopping by other conifers that are within or outside the 5 meter fixed-radius plot. Ignore overtopping by residual overstory conifers if the candidate is of a shade tolerant species (true firs except noble fir, hemlocks, spruces, and cedar except incense cedar). Stand condition is described in the Condition Class Attribute section on page 55.

Whether or not a conifer is or will be overtopped is estimated by using the "inverted cone" method. This method projects two straight lines along the branch tips of a tree's cone-shaped crown upward from their intersection at the tree's tip to create an imaginary cone, in the growing space above the tree as shown in the figure below. If one-third or more of the imaginary cone is occupied by the live

crown(s) of other conifer(s), the tree is considered overtopped. If less than one-third of the imaginary cone is occupied, the tree is considered "free-to-grow".

7. Only one hardwood in a hardwood clump can be selected. If more than one stem in a clump is a candidate for being tallied, select the candidate most likely to dominate the other candidate(s). Do not tally seedling-sized suckers sprouting from the base of base of a live, unsuppressed hardwood stem that is ≥ 12.5 cm. d.b.h. A clump is defined as 3 or more live stems that sprouted from a common root system which had originated as part of a earlier tree whose above-ground bole was cut or is no longer alive.

8. Select trees by the following species priority:

- a. Ponderosa pine or western larch if the site is capable of growing crops of these species
- b. Conifer species except for Pacific yew, incense cedar, and western juniper.
If several conifer species are present, select trees of conifer species being managed for first if management is evident.
- c. Incense cedar
- d. Red alder, black cottonwood, aspen and hybrid poplar.
- e. All other hardwood species except for dogwood, cherries, willows, hollies, mountain mahogany and species coded 999.

Do not tally western juniper, Pacific yew, dogwood, cherries, willows, hollies, mountain mahogany or species coded 999. Within each level of species priority, select trees in order of dominance and vigor.

Step 2: Tally additional trees, if present, until the total number of trees tallied in Steps 1 and 2 is 20. The additional trees must meet the following criteria:

1. Select only trees < 12.5 cm. d.b.h.
2. Select only trees whose bole centers at the ground are within 5 meters (horizontal distance) of subplot center.
3. Select only trees whose bole centers at the ground are at least 1 meter away from any other stocking tally (prism, Step 1, or Step 2) tree.
4. Select only trees that at least 15 cm. tall and are established in mineral soil.
5. Select only trees that are expected to live at least 5 more years.
6. Only one hardwood in the clump can be selected in step 2. Select the best candidate: the tree--except for a tree, if any, already selected in step 1--that is most likely to dominate other remaining trees in the clump. Do not tally seedling-sized suckers sprouting from the base of base of a live, unsuppressed hardwood stem that is ≥ 12.5 cm. d.b.h.
7. Do not tally dogwood, cherries, willows, hollies, mountain mahogany and species coded 999.
8. Select trees by the following priority:
 - a. Conifers (including western juniper) that are free-to-grow except Pacific yew.
 - b. Hardwoods that are free-to-grow.
 - c. Conifers that are not free-to-grow, but will live 5 more years and are not suppressed. And:
Pacific yew.
 - d. Hardwoods that are not free-to-grow, but will live 5 more years and are not suppressed.

Within each level of priority, select trees in order of dominance and vigor. A "free-to-grow" conifer is defined on page 159. A hardwood is free-to-grow if it is not currently overtopped and will not be overtopped by another tree before it is 22.5 cm. d.b.h.

D. Tree data

Enter a record (line) for each tree selected on a stocking subplot. If no trees are selected on a subplot, enter a record with only the stocking subplot number, the condition class number, and a species code of "000" recorded.

Item 1--Stocking subplot number (Sub pl)

Record a 2-character code for each tree. The first character is always an "S", and the second is a number 1 through 5. Instructions for assigning subplot number are covered in section B, "Locating and numbering subplots."

Item 2--Condition class (Cc)

Record a 1-digit code for each tree. Record the same condition class number that was assigned when the class was mapped on the permanent 5-subplot layout.

Item 3--Species (SPC)

Record a 3-digit code for each tree. Use the same codes used for trackable trees (see page 101).

Item 4--Diameter (DBH)

Record a 4-digit code for each tree. Measure or estimate diameter at breast height to the nearest centimeter. Seedlings are recorded "0001".

Item 5--Height (HT)

Record a 3-digit code for each tree. Measure or estimate height to the nearest decimeter if the tree is an estimated 5 meters or less in height. If estimated to be greater than 5 meters tall, measure or estimate height to the nearest meter.

Item 6--Breast-high age (BH AGE)

Record a 3-digit code for each tree. For tally trees less than 1.37 m in height, record an age of "0". Do not bore stocking trees for age, but counting branch whorls on Douglas-fir seedlings, and on pines and true firs to determine precise age should be done. An asterisk to indicate a "bored" (counted) age is not recorded.

Item 7--Crown ratio (CR)

Record a 1-digit code for each tree. Use the same codes used for trackable trees (see page 112).

Item 8--Damaging agent and severity (Agt, S)

Record a 2-digit damaging agent code and a 1-digit severity code for each tree. Use the same codes used for trackable trees (see page 119). If more than one damaging agent is present, record the one that will have the most impact on the tree's growth and survival.

Item 9--Mistletoe Rating (M)

Record a 1-digit code for each tree. Use the same codes used for trackable trees (see page 114).

Item 10--Crop tree (CT)

Record a 1-digit code for each tree. If the tree was selected in step 1 of the tree selection procedures, crop tree is coded "1". If the tree was selected in step 2, crop tree is coded "2".

E. Inhibiting vegetation

Complete this item for each stocking subplot. Information on the shading of conifers by inhibiting vegetation is used in the analysis of silvicultural treatment opportunity. Regeneration conifer stands that are competing with inhibiting non-conifer vegetation are opportunities for release treatment. Nonstocked areas with inhibiting vegetation are opportunities for site preparation.

For each stocking subplot, record in the stocking subplot summary:

- 1.) Subplot number: Record the 2-character code determined for the stocking subplot.
- 2.) Inhibiting vegetation: Record a 1-digit code that best describes the condition of the 5-meter fixed-radius stocking subplot. Select from the following choices:

If one or more conifers are tallied on the 5-meter fixed radius subplot, record one of the following codes:

<u>Code</u>	<u>Description</u>
1	50 percent or more of the conifers tallied are threatened or overtopped by hardwoods <17.5 cm. d.b.h. (one-third or more of the imaginary cone is occupied by the live crown(s) of hardwood(s)), or by nontree vegetation (two-thirds or more of the imaginary cone is occupied by the live crown(s) or spring and summer foliage of nontree vegetation).
2	Less than 50 percent of the conifers tallied are threatened or overtopped by hardwoods or nontree vegetation (as defined in 1).

If no conifers are tallied on the 5-meter fixed-radius subplot, record one of the following codes:

<u>Code</u>	<u>Description</u>
3	50 percent or more of the 5-meter fixed-radius subplot is shaded by hardwoods less than 17.5 cm. d.b.h. <u>Or</u> : 50 percent or more of the 5-meter fixed-radius subplot is covered in the spring and summer by any combination of: <ol style="list-style-type: none"> a.) grasses or sedges of any height, and/or b.) other nontree vegetation (most notably, "non-viney" shrubs) whose spring and summer foliage is generally 0.3 meters or more above the ground.
4	Less than 50 percent of the 5 meter fixed-radius subplot is shaded by hardwoods less than 17.5 cm. d.b.h., and less than 50 percent of the 5 meter fixed-radius subplot covered by nontree vegetation (as defined in 3) .

F. Precommercial thinning on stocking subplots

Complete this item for all 5-meter fixed-radius stocking subplots. This item is used in making area estimates of opportunities for precommercial thinning. Code "Y" if there are stumps from trees < 12.5 cm d.b.h. that were cut within the last 10 years present on the 5-meter fixed-radius stocking subplot. Otherwise, code "N".

G. An exceptional case

The following situations will occasionally occur:

- 1) A plot at Oc3 required that subplots be substituted to stay entirely in a one forest condition class. Had the plot have been laid out entirely on the standard layout at Oc3, a second forest condition class would have sampled. At Oc4, the plot is fully laid out on the standard layout, and the both the Oc3 sampled condition class (1) and this second condition class are treated as separate mapped classes at Oc4.

If both condition classes were cut or thinned within two years of one another and then treated silviculturally as one unit after the management activity, and that unit would be treated as one condition class if the plot was being installed for the first time; only one set of stocking plots is required. The phrase "treated silviculturally as one unit means that both classes have been subjected to the same schedule of silvicultural activities since the management activity took place, and each silvicultural event (for example: site prep or planting) occurred simultaneously and in the same manner in each class.

- 2) A plot measured at Oc4 is split into multiple condition classes solely because of a land ownership boundary.

If two or more subplots on the standard plot layout would have been considered as one condition class by using all other GLC and Stand Condition mapping rules but are divided into more than one condition class only because of a land ownership boundary, follow the instructions below.

In these 2 cases the locations of the stocking plots should be selected as if the two mapped classes were only one. Assign all stocking tree records tallied only to one of the two classes. When done taking stocking plots, each record must be duplicated, and the duplicate assigned to the other condition class; the same protocol applies to entries for inhibiting vegetation and for the presence of precommercial thinning. In "Present condition/ past disturbance", describe the situation and note that stocking plot records are duplicated.

XIII. COORDINATES (GPS) and LASER 200

TABLE OF CONTENTS

XIIIa. COORDINATES (GPS)	165
A. Overview	165
B. When and where to collect readings	165
C. Recording GPS information	165
GeoExplorer	165
PLGR	165
D. Instructions for the GeoExplorer	166
Collecting coordinates	166
Managing and deleting files	167
E. Instructions for the PLGR.....	167
Manipulating the PLGR:.....	167
PLGR Setup Options	168
Operating the PLGR	169
Navigating by using the PLGR	169
F. Batteries	169
GeoExplorer	169
PLGR	170
Primary batteries.....	170
Memory battery.....	170
G. Turning a machine off:	170
GeoExplorer	170
PLGR	170
XIIIb. LASER 200 INSTRUCTIONS	171
A. Overview:	171
B. Basic operation:	171
C. Settings:	171
D. Filter and Reflectors:	172
E. Distances and % slope:.....	172
F. Tree heights:.....	172
G. Gates:	172
H. Cumulative distances:	173

XIIIa. COORDINATES (GPS)

A. Overview

An objective of the inventory is to obtain accurate coordinates for each field grid location. When possible, this is done by using GPS recorders on each visited plot. GPS stands for Global Positioning System, a technology that uses signals from satellites to triangulate and compute the coordinates of locations on the ground.

PRIME uses two types of GPS recorders to collect coordinates: the GeoExplorer and the PLGR military receivers. PLGR stands for Precision Lightweight GPS Receiver. Protocol on where to collect readings is the same for both machines, but operating instructions differ.

B. When and where to collect readings

For each plot visited, attempt to collect a GPS file that has at least 180 satellite readings. Always start GPS procedures on a plot by trying to collect an adequate set of readings at the center of subplot 1 on the standard layout; the objective is to obtain coordinates at this subplot center, the field grid location. A good plan is to try to collect an adequate set of readings as soon as the center of subplot 1 is located, and, if unsuccessful, to try again shortly before going to the next subplot. Success is GPS-generated coordinates for the field grid location that are based on 180 or more readings.

If unsuccessful at the field grid location, try to collect an adequate set of (≥ 180) readings at the end of one of the three transect lines radiating out from the center of subplot 1. Visit the end of all three if necessary. Be sure that the readings are taken at the exact end of a transect because transect length (16.95 horizontal meters) and azimuth are required to convert the GPS coordinates recorded at the end of the transect to the coordinate at the center of subplot 1. If unsuccessful at the ends of all three transects, proceed to the center of subplot 2 on the standard layout.

On subplot 2, repeat the procedure applied on subplot 1, trying first at subplot center. If unsuccessful twice at the center of subplot 2, try to get an adequate set of readings at the end of a transect. If still unsuccessful, try again at the subplot centers on subplots 3, 4, and 5 until you get a position with more than 180 readings. Do not attempt readings at the end of transects on subplots 3, 4, or 5 because these readings are apt to be inaccurate due to cumulative chaining errors between subplot centers.

If more than one coordinate is collected, record the coordinate that is closest to subplot 1 center and has at least 180 readings. Write any other collected GPS coordinates on the front of the plotcard.

C. Recording GPS information

GPS information is required and recorded in the Husky field data recorder regardless of which GPS machine is used or whether a coordinate was successfully obtained. For both units, record whether coordinates were successfully obtained, and the type of machine used.

GeoExplorer

If a GeoExplorer was used, record the subplot and, if applicable, transect the coordinates were taken on and the identification code (ID) of the machine; this ID, labeled on the machine, corresponds to the first letter of each filename. The letters A through H are used to identify GeoExplorer units.

PLGR

If a PLGR is used, record the subplot and, if applicable, transect the coordinate was taken on, the ID of the machine, the Easting and Northing (X and Y) coordinates, the number of readings that were averaged, and the error statistic, the maximum error displayed while the machine was averaging readings. Beware that the PLGR may stop averaging the position if this error becomes too large, and, when this occurs, the error figure should not be recorded. The numbers 1 through 9 are used to identify the PLGRs and are marked on the machine.

D. Instructions for the GeoExplorer

Collecting coordinates

A file must be opened in order to start recording readings.

From the Main Menu select <1.Data Capture>
select <1.Open Rov. File>.

Once enough readings have been collected, or you've decided the unit is unable to collect readings,
select <3.Close File>

IMPORTANT: If a file has been opened, and you were unsuccessful in collecting readings, close the file and open a new one when you try again. This will make it easier to handle the file in post processing.

NOTE: If the menu option <1.Open Rov. File> does not appear, a file is already open, and the screen appears as described below. Close the file and then select <1.Open Rov. File>

When <1.Open Rov. File> is selected, the following items will appear on the screen:

- 1) the Filename (in the upper left hand corner)
- 2) the number of coordinate readings recorded in open file (shown in the upper right corner)
- 3) a menu to choose from in the bottom three lines

The number of coordinate readings that the open file contains is incremented automatically when the GPS unit is able to collect readings. Obtain 180 or more readings and close the file.

The filename contains a letter, 6 numbers, and then another letter. The first letter identifies the particular GeoExplorer recorder used to obtain the readings on a plot. The next four numbers are the month and day respectively. Make sure that the current month and day are recorded; if not current, close the file and open a new one until today's date appears. The next two numbers are the hour in Greenwich Mean Time or Zulu time, and the last character is incremented if more than one file is collected within the same hour.

The menu options are <1.File Status>, <2.Pause>, <3.Close File>, <4.Main Menu>, as follows:

1. **File Status** shows the size of the file which increases as readings are recorded, and the amount of remaining memory which decreases as more readings are taken.
2. **Pause** temporarily stops the GeoExplorer from taking readings. Say, for example, you had to leave the plot to eat some plump blackberries before your partner eats them all: press "pause," go chow down, then come back and hit <2.Resume> to resume taking readings.
3. **Close File** closes the file once you enter "Yes" to the prompt; you won't be allowed to open the same file again.
4. **Main Menu** allows you to use the options in the Main menu. The most useful option displays information about the number of the satellites that the unit can receive signals from and the quality of these signals.

Once a file is open, the option from the Data Capture Menu - <4.Main Menu> will put you at the Main Menu; you can't hit escape to get to the Main Menu once a file is open. From the Main Menu select <3.GPS Status>, and then select <1.Sat Tracking> to see what satellites the unit is tracking.

From the Main Menu, you can also select <2.Position> to see if the unit has computed your position. If it has, the top line will read GPS Position. If hasn't, it will say "Old Position". GPS Position is continually updated with each additional reading.

To return to see how many readings you have collected or to close the file, select <1.Data Capture> from the Main Menu.

Managing and deleting files

The GeoExplorer can record readings for approximately 3 hours without running out of memory. The memory remaining on the GPS unit can be viewed only when a rover file is open, under the Data Capture Menu option <1.File Status>.

Once a file is downloaded to the laptop, it can be deleted, but, to be safe, delete a file only after it is a week old (based on the date in the filename.) To delete a file, from the Data Capture Menu, select <4.Delete File> and highlight the file to be deleted and hit Enter (the center diamond key). Then answer "Yes" if you are sure you want to delete this file.

Files that were opened but do not have enough readings can be deleted anytime, even right after the file is closed. It is good practice to keep only a small number of files on a GPS recorder. This reduces confusion and limits errors from happening.

IMPORTANT: For each file that has enough readings, record on the Plot Record:

- 1) the 8-character filename
- 2) subplot number where the file was collected.

This information is essential for proper handling and identification of the files back at the office. Once a file with >180 readings is recorded, the GPS job is done for the plot.

E. Instructions for the PLGR

PLGR stands for Precision Lightweight GPS Receiver. It is a PPS (Precise Positioning Service) receiver. This means that it can read the encoded information from the satellites that contains the corrections to remove the intentionally introduced errors. The coordinates that it computes thus do not have to be differentially corrected.

WARNING: Do not remove the memory battery located in the bottom of PLGR as this will erase the CRYPTO key which allows the unit to decode the introduced selective availability (SA) errors. If this key is erased the unit will need to be returned to the manufacturer for service and repair. See further instructions in Section F. Batteries.

Manipulating the PLGR:

Adjust screen backlight: ON/BRT key plus up/down key for rapid change.

Check display status: use MENU key, STATUS.

LEFT/RIGHT arrow keys move the cursor between fields and identify changeable fields.

UP/DOWN arrow keys make selections, scroll through menu pages when the ô symbol appears in the lower right hand corner, and change the contents of a field when it's blinking.

On-line help: MENU key, HELP option or press LEFT/RIGHT arrow keys at the same time.

NUM LOCK key toggles the mode of the keypad: control or numeric. In Numeric mode when N is visible in the lower right hand corner of screen.

Keypad map: press ON/BRT key and MENU key at the same time.

PLGR Setup Options

Listed below are the parameters to be setup before collecting satellite readings. Only the Setup mode needs to be reset each time the unit is turned on to collect readings. Each page is underlined, and each option has an asterisk. **IMPORTANT: Make sure that the DATUM being used is the North American Continental US of 1927 (Clarke 1866). This is set on the SETUP DTM page. Using a different datum will alter the coordinates significantly.**

Press MENU key, SETUP option to scroll through the following pages:

SETUP MODE

CONT for continuous tracking of satellites. **NOTE:** This mode has to be set each time the PLGR unit is turned on to collect a coordinate.

Once the error has gone down to +/-20m, switch to AVG mode.

SV-Type : mixed

SETUP UNITS

Select the UTM/UPS datum.

Select METRIC Units.

Elev: METER for metric elevation.

MSL for mean sea level, as opposed to DTM or height above ellipsoid datum.

ANGL: DEG for degrees.

Select TRUE for True North. Other options are Mag for magnetic north, and Grid for grid north.

SETUP MVAR

TYPE: CALC for calculated magnetic variation. The unit computes declination

SETUP

ELHold: AUTOMATIC

Pacific Standard Time computed from Greenwich Meantime.

TIME: Loc = Z - 0800 for Daylight savings time OR

Loc = Z - 0700 for normal time.

ERR: + - m. Sets the error display in distance units as instead of FOM (figure of merit) codes.

SETUP DTM

Select: NAS-C (No Amer-CONUS) Datum which is the North American Continental United States datum taken in 1927.

Select: AUTOMATIC OFF TIMER:20min to automatically turn the unit off 20 minutes after it obtains a good fix or after 15 minutes of trying to get a good fix. This will help in saving battery life.

SETUP I/O

SERIAL: Standard

To check to the **CRYPTO** key:

from the Main Menu

select OPS - if the key is installed "CRYPTO" appears as a menu item in the lower right corner.

Other options within the setup pages are of no use in the western Oregon inventory for GPS data collection. See the Operations and Maintenance Manual for specific information.

Operating the PLGR

Carry extra batteries at all times. The eight AA-alkaline batteries die after approximately four hours of use. See Section F for more details.

Check the SETUP pages to make sure that the unit is in CONT (continuous) mode and that the rest of the SETUP settings are as described in "PLGR SETUP OPTIONS".

To see if the unit has obtained coordinates, press the POS key and scroll till a page with coordinates appears. If the unit has computed coordinates, a figure in the top-right corner will appear; otherwise the word OLD will appear to indicate that it hasn't computed coordinates yet. In continuous mode the unit will continue to track satellites, and the distance error will decrease over time.

Once the error has decreased to +/- 20m, switch the mode to Averaging (AVG) in the SETUP pages. Always try to obtain at least 180 readings in averaging mode. The number of averaged readings is displayed on the first POS page. Once 180 readings have been collected, record the X and Y coordinates displayed by PLGR in the Husky data recorder.

If the readings do not decrease to +/-20m after a reasonable time, switch to averaging mode anyhow but be sure to record the error figure in the appropriate field. Try to obtain better coordinates for the plot at a different subplot or later in the day.

Navigating by using the PLGR

Once the PLGR has waypoints stored, it can be used to navigate to these waypoints. To navigate to a waypoint, the navigation display pages must first be setup. These are accessed through the MENU option USER-DEFS, NAV DISPLAYS. In this part of the program, the display of the navigation pages are setup. There are ten pages that the user can setup, but the default page 1 is all that is needed for most purposes. The four default display fields are Waypoint (WP) on the top line, Azimuth (AZ) to the waypoint on the second, Range (RNG) to the waypoint on the third, and elevation difference (ELD) on the fourth.

To navigate, press the NAV key, and press the up or down arrow till a page with TO/FROM waypoint appears. Select the waypoint you want to go to by hitting the RIGHT arrow key to select the waypoint number field, and then scrolling to the waypoint (or enter it numerically) you want to navigate to. Once the correct waypoint is selected, hit the LEFT or RIGHT arrow until the - symbol appear in the bottom right corner. Pressing the up or down arrow keys to scroll through the display pages as you have set them up. The first page should show the waypoint and the azimuth and distance to that waypoint. For detailed information, refer to pages 4-11 in the Operation and Maintenance Manual issued by the manufacturer.

F. Batteries

GeoExplorer

GeoExplorer machines use four AA batteries, which need to be changed after about three hours of use. Signs of weak batteries include the screen dimming, the machine turning off automatically, the inability to turn the machine on, and the inability to take satellite readings. If the batteries are low, the machine uses all remaining power in the batteries to save the files that are already in memory and will not perform normal functions (such as turning on). When replacing batteries, the machine can store the files in memory for approximately 15 minutes, so keep the old ones in the machine until the new ones can be put in immediately after removing the old ones.

When replacing the batteries, **reset the battery usage timer**. To do this:
from the Main Menu select <6.Configuration>
select <10.Battery Usage>
hit "Enter" to reset the timer.

The timer in the GeoExplorers can be used to determine if the batteries are weak, and therefore, a possible reason why a machine is not acting normally (i.e., a machine can be turned on but only functions superficially, but if new batteries are inserted, the machine has the power to pick up satellites).

PLGR

PLGR machines use eight AA batteries, which usually last for about four hours of use. These are called the **primary batteries**. The machine also has an internal **memory battery** which can briefly operate the machine while the primary batteries are discharged or removed. **Never** remove both the primary and memory battery at the same time or never remove one of the batteries when the other one is discharged! If this occurs the CRYPTO key described in Section D. will be erased and the machine will need to be returned for service.

Primary batteries

When the timer in the PLGR shows the primary batteries are depleted the unit displays a LOW PRIMARY BATTERY warning. At this time, the eight AA batteries should be replaced using the large round screw-on cover at the top of the machine. Because the PLGR does not check the voltage of batteries, but uses a timer to determine when they are due to be replaced, it is imperative that the timer be reset when the new batteries are installed. **To reset the battery timer:**

- from the Main Menu:
- select STATUS menu
- select Battery power screen
- select AA-Alk non-rechargeable
- select RST (reset)

Memory battery

When the internal memory battery is low (about once a year) a LOW MEMORY BATTERY warning is displayed. Replace the battery as soon as possible (definitely before using the PLGR on another plot). Each crew supervisor will have several spares. The 3.6v lithium battery is replaced at the sealed cap at the bottom of the PLGR. The (+) end (end with the knob) is inserted first. Do not remove the memory battery while the primary batteries are removed or discharged.

G. Turning a machine off:

GeoExplorer

It is imperative that, when finished using a GeoExplorer, you turn it OFF. The GeoExplorer does NOT turn off automatically like a HUSKY data recorder does. To turn a GeoExplorer off, hold down the ON button until the timer that appears counts down. To do a quick turn off, hold down the center (diamond) key and the ON/OFF button at the same time. Remember to close the file if it is open before turning the machine off.

PLGR

It is important to turn a PLGR off after use to increase battery life. PLGRs should be setup to turn off after 20 minutes of inactivity, but always check the machine is off when done using it.

XIIIb. LASER 200 INSTRUCTIONS

A. Overview

Accurate heights are necessary in our inventory in order to determine volume. The Laser can be used to get fast and accurate tree heights. It can also be used to measure distances and % slope. This instrument is more fragile than the GPS units. Some precautions must be taken with the Lasers to keep them working properly. These are:

1. Never look at the sun through the scope. Looking directly at the sun can permanently damage your eyes.
2. Never point the Laser directly at the sun. Exposing the lens system to direct sunlight, even for a brief period, may permanently damage the laser transmitter.
3. Do not expose the Laser to extreme temperatures. It is rated for a temperature range of -22 deg. F to +140 deg. F. Don't leave the instrument in the vehicle during the heat of the day.
4. Do not use batteries with "voltage check" features built on the batteries. The battery case of the Laser is too narrow for these batteries, and they could get stuck in the instrument.
5. Do not drop the Laser. Immediately return it to its case when you get back to the vehicle. There is usually more danger of damaging the instrument in the vehicle than out in the woods.

B. Basic operation

All directions for using the Laser buttons are given assuming you are holding the instrument with the LCD display screen facing you and the 2 round lenses are facing the object you want to measure. The buttons will be referred to as:

- L1 the left button closest to you
- L2 the left button in the middle
- L3 the left button furthest away from you
- R1 the right button closest to you
- R2 the right button in the middle
- R3 the right button furthest away from you

Turn the Laser on by pushing L1 or R1

Turn it off by pushing L2 and L3 at the same time. The Laser may turn itself off after a period of inactivity. Once the instrument is on, push the R1 button to make the red dot appear in the sighting scope. If there is no red sighting dot, repeatedly push the L2 button until the red dot appears and is the correct brightness.

To light up the display screen, press L3. Press L3 again to turn off the light.

C. Settings

Make sure the settings are correct before using the Laser. To set the correct measurement units, go into the main menu and:

1. Press R2 or R3 to scroll through the menu until SYS is displayed in the upper right hand corner of the screen.
2. Press R1. ON or OFF will show in the center of the screen. FILTER will flash at the bottom.
3. Press R2 until OFFSET is flashing. The number displayed should be 0000.00.
4. Press R2 until PIVOT is flashing. The number displayed should be 0000.18. When this number is set at 0.00, the Laser is set to calculate heights using a tripod attached to the center of the instrument. The pivot point is the center of the Laser. We use the pivot value at 0.18 because this sets the pivot point at the rear of the instrument, and this allows you to shoot a height while using your head as the pivot point. To change this number, press L1 until the number you want to change is flashing. Press L2 or L3 until the correct number is showing. When the number is set at 0000.18, press R1.
5. Press R2 until UNITS is flashing. Select M (meters) or F (feet) using the R1 button.

6. Press R2 again and D (degrees) should be flashing. If not, press R1 to toggle on D.
7. Press R2 again and % should be flashing. It should say ON. If not, press R1.
8. Press R3 twice to accept the new settings and back out to the main display.

D. Filter and Reflectors

When you are working in areas of dense brush, you need to make sure the Laser is giving you the distance to the correct target. The best way to do this is to use a reflector as a target and use the filter option on the Laser. The Laser will only lock onto the highly reflective targets and ignore the less reflective brush. To use the filter option:

1. Place a reflector (or have someone hold it) on the tree where it can be seen from the required distance. The Laser will not work in the filter mode without a reflector as a target.
2. Go to the main menu on the Laser and push R2 or R3 until SYS is displayed on the screen.
3. Press R1 to select the SYS option. The FILTER option will blink, and it will say the FILTER is OFF or ON.
4. Push R1 to toggle FILTER between ON and OFF.
5. Press R3 to save the desired setting and to back out into the main display. When the FILTER is on, FILTER will appear at the bottom of the screen when the Laser is measuring distances.

E. Distances and % slope

Horizontal distance (HD): Turn the Laser on. The top-middle of the LCD screen will say HD. Point the red sighting dot at the target. Press R1 and hold it down until the Laser locks on the target, then release. You can tell when the instrument locks onto its target by sound. It buzzes while it is searching for the target, then beeps when it locks on to a target or there is an error. If you get an error message, simply aim again and press R1.

Slope distance (SD) and Vertical distance (VD): Push R2 or R3 until the correct display is shown. Then aim and press R1 until the Laser locks on target. Or, measure a horizontal distance, then push R2 until the correct display is shown.

% slope: Press R2 or R3 until INC is displayed. Then aim and press R1.

F. Tree heights

The best way to measure a tree height is to make sure you have a clear shot at the leader or a clear shot of the tree trunk. Make sure you are getting a distance to the tree trunk, and not some branches in front of it. If you can't get a clear shot at the leader or the tree trunk, use a reflector (see section D). Once you are in position with your target in sight, go to the main menu:

1. Push R2 or R3 until HT is displayed in the upper left of the screen.
2. Push R1 once, aim at the target, then push R1 until the Laser locks on target. This will measure the horizontal distance.
3. The down arrow will flash. Aim at the base of the tree and push R1 to get the % slope.
4. The up arrow will flash. Aim at the top of the tree and push R1 again to get another % slope.
5. Press R1 once more and the Laser will display the height. Make sure this height is reasonable before recording it in the Husky.

G. Gates

The gate option can extend the Laser's minimum range or restrict its maximum range. It is most often used to help you make sure you are hitting the right target when objects near you or just beyond your target might give you false readings. You don't have to set both gates. You will probably only need to set the short gate because of brush or fog between you and your target. You can set a gate by shooting a target or by entering distances into the instrument. To set a short gate by laser, go to the main menu and:

1. Press R2 or R3 until GATE is shown on the display.
2. Push R1 to select the gate option.
3. Press R1 to toggle the gate between ON and OFF.

4. Push R2. The S indicator will flash.
5. Aim at a target that is at the distance you want to set as the short gate and press R1.
6. Now you can either set a long gate, or press R3 to go back to save the short gate and return to the main menu. The S will be displayed when you are measuring distances to show the short gate is on.

To set a long gate:

7. Push R2. The L indicator will flash.
8. Aim at an appropriate target and press R1
9. Press R3 to save the gate and go back to the main display. The L will be displayed when measuring distances.

The gates are reset to OFF when the Laser is turned off, but gate values are saved in memory. This means that if you have saved a gate and turn off the instrument, when you turn it back on the gate will be set to OFF. If you go back into the gate option and turn the gate ON, it will remember the last distances you shot for the long and short gates.

To clear out a gate value: Display the gate values by following the instructions in this section (section G). When the desired gate value is displayed, press and hold down R3 until the number is deleted.

H. Cumulative distances

A cumulative distance measurement allows you to move from one target point to the next, stopping at each one to measure the distance to the next target point. The Laser accumulates the measured distances in both slope and horizontal distances (SD and HD) to give you a running total.

To take a cumulative distance, go to the main menu and:

1. Press R2 or R3 until MULTI is displayed on the screen.
 2. Press R1 to enter the MULTI option. DIFF will be displayed.
 3. Press R2 once. CUM will be displayed.
 4. Press R1. Either SEL or a number will be displayed. If SEL is displayed, HD will flash on and off. Press R1 to toggle between HD and SD. Press R2 when the correct indicator is flashing. If a number is displayed, that means there is already a cumulative distance saved on this instrument. You can either clear out this distance by holding down R3 until 0.00 appears, or continue to add to the distance by going to step 5.
 5. Aim at the target and press R1 to fire the laser.
 6. If you are not satisfied with the measurement, repeat step 5 to retake the measurement.
- If you are satisfied with the measurement, and wish to add it to your total, press R2. The new total will be displayed.

7. Repeat steps 5 and 6 to add more measurements to the total.

You can choose whether you want horizontal or slope distances at any time. If a distance has been measured, you can change from slope or horizontal distance by pressing R3 twice. SEL will be displayed. Push R1 to toggle between SD and HD. Press R2 twice to get back to the total distance. Go to step 5 to add more distances.

The cumulative measurement total is saved in memory even if the instrument is turned off. Turn the instrument on and scroll back to the MULTI-CUM option and resume the procedure with step 5. To clear out the current total and begin another series of measurements, hold down R3 while the cumulative distance is showing until the number is deleted.

XIV. APPENDICES

TABLE OF CONTENTS

XIV. APPENDICES.....	175
APPENDIX 1 -- SLOPE CORRECTION TABLE	177
APPENDIX 2 -- HORIZONTAL LIMITING DISTANCE TABLE	178
APPENDIX 3A -- STOCKING CALCULATION TABLE, 20 BAF.....	179
APPENDIX 3B -- STOCKING CALCULATION TABLE, 30 BAF.....	180
APPENDIX 3C -- LOW SITE (GLC 49) PLANT ASSOCIATIONS	181
APPENDIX 4 -- LIST OF THE OC3 20 BAF PLOTS.....	183
APPENDIX 5 -- METRIC EQUIVALENTS AND AIDS	184
APPENDIX 6 -- ACCESS-DENIED PLOTS	186
APPENDIX 7 -- OC1, OC2, AND OC3 10-POINT PLOT LAYOUT	188
APPENDIX 8A -- HELLO LETTER	189
APPENDIX 8B -- LANDOWNER CONTACT LETTER	190
APPENDIX 9 -- GLOSSARY	192
APPENDIX 10A -- CHECK PLOTS.....	199
APPENDIX 10B -- CHECK PLOT FORMS	200
APPENDIX 11 -- INSECT AND DISEASE KEYS.....	205
APPENDIX 12 -- TREE VOLUME TABLES	209
APPENDIX 13 -- SAMPLE PLOT FORMS.....	211
APPENDIX 14 -- INDEX.....	227
APPENDIX 15A -- IMPORTANT PHONE NUMBERS.....	231
APPENDIX 15B -- VEHICLE & PHONE NUMBERS	232
APPENDIX 16 -- BLANK PAGES FOR NOTES.....	233

APPENDIX 1 -- SLOPE CORRECTION TABLE

PERCENT T	EXPANSION FACTOR		----- SLOPE DISTANCE -----			
	FACTOR	RECIPROCAL	16.95 m	30 m	32 m	64 m
10	1.005	0.995	17.0	30.2	32.2	64.3
15	1.01	0.99	17.1	30.3	32.3	64.6
20	1.02	0.98	17.3	30.6	32.6	65.3
25	1.03	0.97	17.5	30.9	33.0	65.9
30	1.04	0.96	17.7	31.2	33.3	66.6
35	1.06	0.94	18.0	31.8	33.9	67.8
40	1.08	0.93	18.3	32.4	34.6	69.1
45	1.10	0.91	18.6	33.0	35.2	70.4
50	1.12	0.89	19.0	33.6	35.8	71.7
55	1.14	0.88	19.3	33.6	36.5	73.0
60	1.17	0.85	19.8	35.1	37.4	74.9
65	1.19	0.84	20.2	35.7	38.1	76.2
70	1.22	0.82	20.7	36.6	39.0	78.1
75	1.25	0.80	21.2	37.5	40.0	80.0
80	1.28	0.78	21.7	38.4	41.0	81.9
85	1.31	0.76	22.2	39.3	41.9	83.8
90	1.35	0.74	23.8	40.5	43.2	86.4
95	1.38	0.72	23.4	41.4	44.2	88.3
100	1.41	0.71	24.0	42.3	45.1	90.2
105	1.45	0.69	24.6	43.5	46.4	92.8
110	1.49	0.67	25.2	44.7	47.7	95.4
115	1.52	0.66	25.8	45.6	48.6	97.3
120	1.56	0.64	26.5	46.8	49.9	99.8
125	1.60	0.63	27.1	48.0	51.2	102.4
130	1.64	0.61	27.8	49.2	52.5	105.0
135	1.68	0.60	28.5	50.4	53.8	107.5
140	1.72	0.58	29.2	51.6	55.0	110.1
145	1.76	0.57	29.9	52.8	56.3	112.6
150	1.80	0.56	30.6	54.0	57.6	115.2

APPENDIX 2 -- HORIZONTAL LIMITING DISTANCE TABLE**20 BAF PRISM (F= .23329)**

DBH (cm)	Dist. (m)	DBH (cm)	Dist. (m)
0.1	0.02	41	9.56
0.2	0.05	42	9.80
0.3	0.07	43	10.03
0.4	0.09	44	10.26
0.5	0.12	45	10.50
0.6	0.14	46	10.73
0.7	0.16	47	10.96
0.8	0.19	48	11.20
0.9	0.21	49	11.43
1	0.23	50	11.66
2	0.47	51	11.90
3	0.70	52	12.13
4	0.93	53	12.36
5	1.17	54	12.60
6	1.40	55	12.83
7	1.63	56	13.06
8	1.87	57	13.30
9	2.10	58	13.53
10	2.33	59	13.76
11	2.57	60	14.00
12	2.80	61	14.23
13	3.03	62	14.46
14	3.27	63	14.70
15	3.50	64	14.93
16	3.73	65	15.16
17	3.97	66	15.40
18	4.20	67	15.63
19	4.43	68	15.86
20	4.67	69	16.10
21	4.90	70	16.33
22	5.13	71	16.56
23	5.37	72	16.80
24	5.60	72.6	16.94
25	5.83	72.7	16.96
26	6.07		
27	6.30		
28	6.53		
29	6.77		
30	7.00		
31	7.23		
32	7.47		
33	7.70		
34	7.93		
35	8.17		
36	8.40		
37	8.63		
38	8.87		
39	9.10		
40	9.33		

30 BAF PRISM (F= .19046)

DBH (cm)	Dist. (m)	DBH (cm)	Dist. (m)
0.1	0.02	41	7.81
0.2	0.04	42	8.00
0.3	0.06	43	8.19
0.4	0.08	44	8.38
0.5	0.10	45	8.57
0.6	0.11	46	8.76
0.7	0.13	47	8.95
0.8	0.15	48	9.14
0.9	0.17	49	9.33
1	0.19	50	9.52
2	0.38	51	9.71
3	0.57	52	9.90
4	0.76	53	10.09
5	0.95	54	10.28
6	1.14	55	10.48
7	1.33	56	10.67
8	1.52	57	10.86
9	1.71	58	11.05
10	1.90	59	11.24
11	2.10	60	11.43
12	2.29	61	11.62
13	2.48	62	11.81
14	2.67	63	12.00
15	2.86	64	12.19
16	3.05	65	12.38
17	3.24	66	12.57
18	3.43	67	12.76
19	3.62	68	12.95
20	3.81	69	13.14
21	4.00	70	13.33
22	4.19	71	13.52
23	4.38	72	13.71
24	4.57	73	13.90
25	4.76	74	14.09
26	4.95	75	14.28
27	5.14	76	14.47
28	5.33	77	14.67
29	5.52	78	14.86
30	5.71	79	15.05
31	5.90	80	15.24
32	6.09	81	15.43
33	6.29	82	15.62
34	6.48	83	15.81
35	6.67	84	16.00
36	6.86	85	16.19
37	7.05	86	16.38
38	7.24	87	16.57
39	7.43	88	16.76
40	7.62	89	16.95

APPENDIX 3A -- STOCKING CALCULATION TABLE, 20 BAF

NOTE: This is a shortcut method for field use. It is not the method used in compiling stocking.

Diameter (cm.)	Trees per Acre	Ponderosa Jeffery Sugar Pines	Douglas Fir	True Firs Spruces	Hemlock	Lodgepole & misc. Pines	Hardwoods	Juniper & Mtn. Mahogany
seedling	10.3	0.6	0.6	0.4	0.4	0.4	1.3	4.0
2.5 - 4.9	10.3	0.6	0.6	0.4	0.4	0.6	1.3	4.0
5.0 - 12.6	10.3	0.9	0.9	0.6	0.6	0.6	1.3	4.0
12.7	22.00	2.6	2.6	2.0	1.6	2.8	4.0	4.0
15	15.77	2.0	2.0	1.3	1.1	2.0	2.6	4.0
18	10.95	1.3	1.3	0.7	0.7	1.4	2.0	4.0
20	8.87	1.3	1.3	0.7	0.7	0.7	2.0	4.0
23	6.71	1.3	1.3	0.7	0.7	0.7	1.3	4.0
25	5.68	1.3	0.7	0.7	0.7	0.7	1.3	4.0
28	4.53	0.7	0.7	0.7	0.7	0.7	1.3	4.0
30	3.94	0.7	0.7	0.7	0.7	0.7	1.3	4.0
35	2.90	0.7	0.7	0.7	0.7	0.7	1.3	4.0
40	2.22	0.7	0.7	0.7	0.7	0.7	1.3	4.0
45	1.75	0.7	0.7	0.7	0.7	0.7	1.3	4.0
50	1.42	0.7	0.7	0.7	0.7	0.7	1.3	4.0
55	1.17	0.7	0.7	0.7	0.7	0.7	1.3	4.0
60	0.99	0.7	0.7	0.7	0.7	0.7	1.3	4.0
65	0.84	0.7	0.7	0.7	0.7	0.7	1.3	4.0
70	0.72	0.7	0.7	0.7	0.7	0.7	0.7	4.0
80	0.55	0.7	0.7	0.7	0.7	0.7	0.7	4.0
90	0.44	0.7	0.7	0.7	0.7	0.7	0.7	4.0
100	0.35	0.7	0.7	0.7	0.7	0.7	0.7	4.0
110	0.29	0.7	0.7	0.7	0.7	0.7	0.7	4.0
120	0.25	0.7	0.7	0.7	0.7	0.7	0.7	4.0
130	0.21	0.7	0.7	0.7	0.7	0.7	0.7	4.0
140	0.18	0.7	0.7	0.7	0.7	0.7	0.7	4.0
150	0.16	0.7	0.7	0.7	0.7	0.7	0.7	4.0
160	0.14	0.7	0.7	0.7	0.7	0.7	0.7	4.0
170	0.12	0.7	0.7	0.7	0.7	0.7	0.7	4.0

Values listed are for one tree tallied on a 10-point plot

Trees < 12.5 cm. dbh are sampled on a **5-meter** fixed radius plot

For other numbers of points multiply the values by $10/N$ where N=number of points.

I.E. for 5 points: multiply by $10/5 = 2.0$

Dominant tree - multiply stocking percent by 1.1

Codominant tree - multiply stocking percent by 1.1

Intermediate tree - multiply stocking percent by 0.7

Overtopped tree - multiply stocking percent by 0.4

Understory seedling - receives 0 stocking percent

* 40 juniper trees (any size) per acre is full normal stocking

APPENDIX 3B -- STOCKING CALCULATION TABLE, 30 BAF

NOTE: This is a shortcut method for field use. It is not the method used in compiling stocking.

Diameter (cm.)	Trees per Acre	Ponderosa Jeffery Sugar Pines	Douglas Fir	True Firs Spruces	Hemlock	Lodgepole & misc. Pines	Hardwoods	Juniper* & Mtn. Mahogany
seedling	10.3	0.6	0.6	0.4	0.4	0.4	1.3	4.0
2.5 - 4.9	10.3	0.6	0.6	0.4	0.4	0.6	1.3	4.0
5.0 - 12.6	10.3	0.9	0.9	0.6	0.6	0.6	1.3	4.0
12.7	22.00	4.1	3.9	3.0	2.4	2.8	6.0	4.0
15	15.77	3.0	2.8	2.2	1.7	2.0	4.0	4.0
18	10.95	2.1	2.0	1.5	1.2	1.4	3.0	4.0
20	8.87	1.7	1.6	1.2	1.0	1.1	3.0	4.0
23	6.71	1.3	1.2	1.0	1.0	1.0	2.0	4.0
25	5.68	1.1	1.0	1.0	1.0	1.0	2.0	4.0
28	4.53	1.0	1.0	1.0	1.0	1.0	2.0	4.0
30	3.94	1.0	1.0	1.0	1.0	1.0	2.0	4.0
35	2.90	1.0	1.0	1.0	1.0	1.0	2.0	4.0
40	2.22	1.0	1.0	1.0	1.0	1.0	2.0	4.0
45	1.75	1.0	1.0	1.0	1.0	1.0	2.0	4.0
50	1.42	1.0	1.0	1.0	1.0	1.0	2.0	4.0
55	1.17	1.0	1.0	1.0	1.0	1.0	2.0	4.0
60	0.99	1.0	1.0	1.0	1.0	1.0	2.0	4.0
65	0.84	1.0	1.0	1.0	1.0	1.0	1.0	4.0
70	0.72	1.0	1.0	1.0	1.0	1.0	1.0	4.0
80	0.55	1.0	1.0	1.0	1.0	1.0	1.0	4.0
90	0.44	1.0	1.0	1.0	1.0	1.0	1.0	4.0
100	0.35	1.0	1.0	1.0	1.0	1.0	1.0	4.0
110	0.29	1.0	1.0	1.0	1.0	1.0	1.0	4.0
120	0.25	1.0	1.0	1.0	1.0	1.0	1.0	4.0
130	0.21	1.0	1.0	1.0	1.0	1.0	1.0	4.0
140	0.18	1.0	1.0	1.0	1.0	1.0	1.0	4.0
150	0.16	1.0	1.0	1.0	1.0	1.0	1.0	4.0
160	0.14	1.0	1.0	1.0	1.0	1.0	1.0	4.0
170	0.12	1.0	1.0	1.0	1.0	1.0	1.0	4.0

Values listed are for one tree tallied on a 10-point plot

Trees < 12.5 cm. dbh are sampled on a **5-meter** fixed radius plot

For other numbers of points multiply the values by $10/N$ where N=number of points.

I.E. for 5 points: multiply by $10/5 = 2.0$

Dominant tree - multiply stocking percent by 1.1

Codominant tree - multiply stocking percent by 1.1

Intermediate tree - multiply stocking percent by 0.7

Overtopped tree - multiply stocking percent by 0.4

Understory seedling - receives 0 stocking percent

* 40 juniper trees (any size) per acre is full normal stocking

APPENDIX 3C -- LOW SITE (GLC 49) PLANT ASSOCIATIONS

The following plant associations and their linked site indexes qualify as low site (GLC 49)

BLUE MOUNTAIN PROVINCE

Ponderosa/Wheatgrass	CP-G1-11	ponderosa pine sites 105 and lower
Ponderosa/Fescue	CP-G1-12	ponderosa pine sites 75 and lower
Ponderosa/Bitterbrush/Ross's sedge	CP-S2-21	ponderosa pine sites 65 and lower
Ponderosa/Blue wildrye	CP-M1-11	ponderosa pine sites 70 and lower
Ponderosa-Douglas fir/Elk sedge	CD-G1-11	Douglas fir sites 70 and lower
Mixed conifer/Pinegrass/Residual soil	CW-G1-11	ponderosa pine sites 50 and lower
Subalpine fir/Grouse huckleberry	CE-S4-11	subalpine fir/mtn hemlock/silver fir sites 50 or less
Subalpine fir/Whitebark pine/Sedge	CA-G1-11	all sites

WALLOWA-SNAKE PROVINCE

Ponderosa/Wheatgrass	CP-G1-32	ponderosa pine sites 105 and lower
Ponderosa/Fescue	CP-G1-31	ponderosa pine sites 75 and lower
Ponderosa/Common snowberry	CP-S5-22	ponderosa pine sites 60 and lower
Subalpine fir/Fools huckleberry	CP-S5-21	subalpine fir/mtn hemlock/silver fir sites 45 or less

CENTRAL OREGON PUMICE ZONE

Lodgepole/Sagebrush/Fescue	CL-S1-11	all lodgepole sites
Lodgepole/Needlegrass basin	CL-G3-11	lodgepole pine sites 65 and lower
Lodgepole/Sedge-needlegrass basin	CL-G4-13	lodgepole pine sites 85 and lower
Lodgepole/Manzanita	CL-S3-11	lodgepole pine sites 70 and lower
Lodgepole/Wet meadow	CL-M9-00	lodgepole pine sites 60 and lower
Ponderosa/Bitterbrush/Bunchgrass	CP-S2-16	ponderosa pine sites 70 and lower
Ponderosa/Bitterbrush/Squirreltail	CP-S2-18	ponderosa pine sites 60 and lower
Ponderosa/Bitterbrush-sagebrush/Squirreltail	CP-S1-12	ponderosa pine sites 75 and lower
Ponderosa/Bitterbrush-sagebrush/Fescue	CP-S1-11	ponderosa pine sites 60 and lower
Ponderosa/Bitterbrush/Fescue	CP-S2-11	ponderosa pine sites 55 and lower
Ponderosa/Bitterbrush/Needlegrass	CP-S2-12	ponderosa pine sites 65 and lower
Ponderosa/Bitterbrush-manzanita/Fescue	CP-S2-17	ponderosa pine sites 50 and lower
Ponderosa/Bitterbrush-snowbrush/Needlegrass	CP-S3-14	ponderosa pine sites 50 and lower
Ponderosa/Bitterbrush/Sedge	CP-S2-15	ponderosa pine sites 65 and lower
Ponderosa/Bitterbrush/Manzanita/Sedge	CP-S2-14	ponderosa pine sites 85 and lower
Ponderosa/Bitterbrush/Manzanita/Needlegrass	CP-S2-13	ponderosa pine sites 65 and lower
Ponderosa/Bitterbrush/Snowbrush/Sedge	CP-S3-12	ponderosa pine sites 65 and lower
Mixed conifer/Snowbrush	CW-S1-14	ponderosa pine sites 60 and lower or Douglas fir site 70 and lower
Mixed conifer/Snowbrush/Sedge	CW-S1-15	ponderosa pine sites 50 and lower
Mixed conifer/Snowbrush/Sedge-bracken fern	CW-C2-13	ponderosa pine sites 50 and lower
Mixed conifer/Snowbrush-manzanita	CW-S1-12	ponderosa pine sites 50 and lower
Mixed conifer/Snowbrush-chinkapin	CW-H1-11	ponderosa pine sites 55 and lower or Douglas fir site 70 and lower
Mixed conifer/Snowbrush-chinkapin/Pinegrass	CW-C2-12	ponderosa pine sites 65 and lower or Douglas fir site 80 and lower
Mixed conifer/Snowbrush-chinkapin/bracknfern	CW-C2-11	ponderosa pine sites 70 and lower or Douglas fir site 85 and lower

WINEMA NATIONAL FOREST

Ponderosa/Bitterbrush-big sage/Fescue	CP-S1-11	all ponderosa sites
Ponderosa/Bitterbrush/Fescue	CP-S2-11	ponderosa sites 55 and lower
Mixed conifer/Snowbrush-mahallomat/Strawberry	CW-S1-16	ponderosa pine sites 60 and lower or Douglas fir sites 70 and lower

FREEMONT NATIONAL FOREST

Ponderosa/Juniper/Mtn mohogany- bitterbrush-big sage/Fescue	CP-C2-11	ponderosa pine sites 55 and lower
Ponderosa/Bitterbrush/Fescue	CP-S2-11	ponderosa pine sites 55 and lower
Ponderosa/Wooley wyenthia	CP-F1-11	ponderosa pine sites 55 and lower
Ponderosa/Mtn bigsage/Bluegrass	CP-S1-21	ponderosa pine sites 55 and lower

WARM SPRINGS RESERVATION

to be determined

MT HOOD NATIONAL FOREST - PONDEROSA PINE ZONE

to be determined

When these plant associations are present with site indexes that are high enough for the plant association to qualify as Timberland, note in the plot description the subplots that are in this plant association.

APPENDIX 4 -- LIST OF THE OC3 20 BAF PLOTS

(015) CROOK

3
4
10
18
26
28
29
30
42

(017) DESCHUTES

6
12
16
24

(031) JEFFERSON

34
38
39
45

(035) KLAMATH

1
9
10
13
14
16
17
24
28
32
33
34
50
51
60
62
89

continued above

(035) KLAMATH (cont'd)

103
105
107
108
145
146
149
153
155
168
170
173
186
197
208
209
212

(037) LAKE

16
17
20
28
29

(069) WHEELER

21
22
29
42
53

APPENDIX 5 -- METRIC EQUIVALENTS AND AIDS

Length

1 inch	=	2.54 centimeters (cm.)
1 foot	=	0.3048 meter (m.)
1 mile	=	1.609 kilometers (km.)

Area

1 acre	=	0.4 hectare (ha.) (approximately)
5 acres	=	2 hectares (ha.) (approximately)
1,000 acres	=	404.7 hectares (ha.)
1 hectare	=	2.471 acres (ac.)
2.5 hectares	=	6 acres (ac.) (approximately)

Volume

1,000 cubic feet	=	28.3 meters (m ³)
1 cubic foot per acre	=	0.07 cubic meter per hectare (m ³ /ha)

Condition class minimum area

0.4 hectares (land class)	=	4,000 square meters	=	40 meters x 100 meters	=	35 meter radius circle
2.5 hectares (forest stand condition)	=	25,000 square meters	=	100 meters x 250 meters	=	90 meter radius circle

Vegetation profile cover percentages

The vegetation profile is done, in most cases, on a 2.41-meter fixed-radius plot (**BAF 30 plots**).

If the entire 2.41-meter plot is one condition class...

1% cover	equals a circle with a 0.2 meter radius
3% cover	equals a circle with a 0.4 meter radius
5% cover	equals a circle with a 0.5 meter radius
10% cover	equals a circle with a 0.8 meter radius
20% cover	equals a circle with a 1.1 meter radius
50% cover	equals a circle with a 1.7 meter radius

The vegetation profile is done, in some cases, on a 2.96-meter fixed-radius plot (**BAF 20 plots**).

If the entire 2.96-meter plot is one condition class...

1% cover	equals a circle with a 0.3 meter radius
3% cover	equals a circle with a 0.5 meter radius
5% cover	equals a circle with a 0.7 meter radius
10% cover	equals a circle with a 0.9 meter radius
20% cover	equals a circle with a 1.3 meter radius
50% cover	equals a circle with a 2.1 meter radius

Basal Area Factor

Metric units: each selected tree represents XX square meters of basal area per hectare

English units: each selected tree represents XX square feet of basal area per acre.

<u>English</u>	<u>Metric</u>
15	3.44
20	4.59
30.5	7
30	6.88

Metric System-length

1 meter	=	10 decimeters (dm.)
1 meter	=	100 centimeters (cm.)
1 meter	=	1,000 millimeters (mm.)

and:

.001 meters	=	1 millimeter
.01 meters	=	1 centimeter
.1 meters	=	1 decimeter
1 meter	=	1 meter
10 meters	=	1 decameter
100 meters	=	1 hectometer
1,000 meters	=	1 kilometer

Photo Scales

<u>Scale</u>	<u>Length on Photo</u>	<u>Length on Ground</u>
1:15,840	1 mm.	15.8 meters
1:24,000	1 mm.	24.0 meters
1:31,680	1 mm.	31.7 meters
1:40,000	1 mm.	40.0 meters

APPENDIX 6 -- ACCESS-DENIED PLOTS

When denied access to a plot, the crew should document on a full-sized sheet of paper all of their contacts with phone numbers and contact dates, describe the situation, and give the reason(s) why access to the plot was denied. The crew will record their own names on the summary. The crew supervisor will make further efforts to obtain access, or will declare the plot inaccessible. The crew supervisor will also document on the sheet his/her efforts including dates of contact, and will record his/her name. If the crew supervisor needs help in gaining access or in determining if the plot can not be visited, he/she should refer the plot to the field coordinator or to the data collection supervisor after documenting all contacts on the sheet with the history, dates, and names of contacts. The sheet should be kept in the plot jacket.

Access is denied to the entire plot:

If access is denied to the field grid location, the entire plot is considered completely access-denied.

1. If the field grid location was nonforest at Oc3, or was out-of-inventory at Oc3, simply write up the situation, describe and diagram the plot area if possible, and return the plot to the crew supervisor. An attempt will be made to reselect these plots.
 - A. If another plot is obtained in the reselection process, that plot is used as the secondary grid sample point.
 - B. If no reselection plot is available:
 - i. Place a plot template on the occasion 4 plot photo and determine the land class of each subplot center. The subplots are N subplots.
 - ii. Record the appropriate condition class, land class, and sample kind.
If the land class is timberland or other-forest, the sample kind is 7.
If the land class is nonforest, the sample kind is 9.
2. If the plot was measured at Oc3, and has an Oc3 and Oc4 GLC that is forest or other-forest:
 - A. If all 5 subplots are in the standard north layout:
 - i. Estimate the total crown cover at Oc3 and Oc4
 - a. Use the Oc3 plot data and photography, whichever is most current at Oc3. For example, the Oc3 photo may show 90% cover in a stand of timber, but the plot data may show that the plot was clearcut at Oc3.
 - b. Use the Oc4 photography or local knowledge, whichever is most current to get Oc4 % crown cover. For example, Oc4 photography may show 90% cover in a stand of timber, but the landowner may have informed you that they have clearcut the stand.
 - ii. If the plot is undisturbed, record the following:
Sample Kind: 5
Oc3 Crown Cover %
Oc4 Crown Cover %
Subplots become P subplots: P1, P2, P3, P4, P5
 - iii. If the plot has been disturbed, but has not been clearcut, record the following:
Sample Kind: 6
Oc3 Crown Cover %
Oc4 Crown Cover %
Subplots become P subplots: P1, P2, P3, P4, P5
 - iv. If the plot has clearcut, the resection procedures will be applied to select another plot that has also been clearcut.
 - v. If one or more of the subplots have been converted to a nonforest land class, they become N subplots with the appropriate condition class, land class, and sample kind.

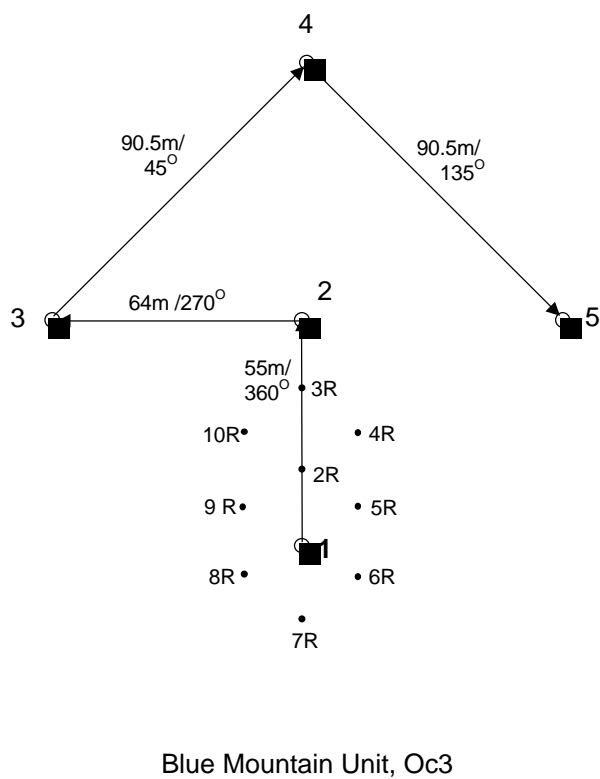
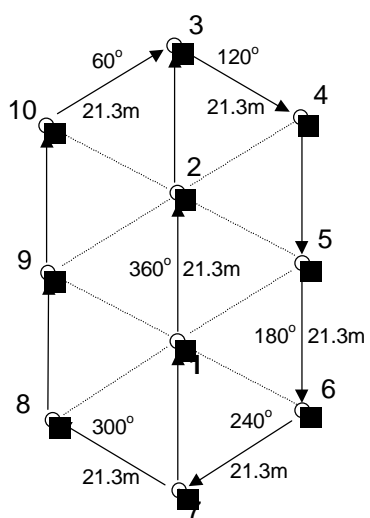
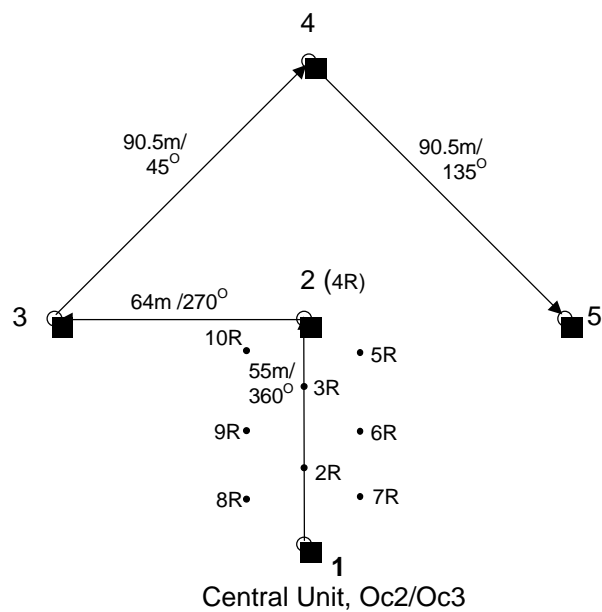
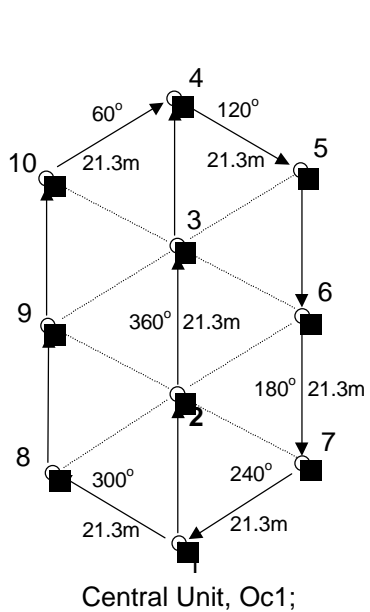
- B. If one or more of the Oc3 subplots has been substituted due to a forested condition change, estimate Oc3 and Oc4 Crown Cover % at the substituted locations. Use the above rules to determine cover %, Sample Kind, and Subplot name.
- C. If one or more of the Oc3 subplots has been substituted due to a land class change:
 - i. The subplots in the standard location will be P subplots.
 - ii. The subplots that were substituted at Oc3 will be put in their standard locations as N subplots and will be given the appropriate condition class, land class, and sample kind.
 - a. Nonforest land classes will have a sample kind of 9.
 - a. Other forest land classes will have a sample kind of 7.

The field grid location is accessible, but access is denied to one or more other prospective ##, N subplots:

Do the following steps:

1. If the field grid location was nonforest at Oc3, or was out-of-inventory at Oc3: install or remeasure accessible subplots following normal procedures. Handle accessible nonforest condition classes as you would normally do. Do nothing about the access-denied subplots other than to write up the situation, diagram the general plot area as best you can. The access-denied subplots become N subplots and have a sample kind of 7. Also record the appropriate condition class and land class data.
2. If the plot was installed or remeasured at Oc3 and the field grid location has an Oc3 and Oc4 forest or other-forest GLC:
 - A. If the access-denied subplot is in the current condition class 1: follow the rules for item 2 A. #1-3 on the previous page to determine Sample Kind and Crown Cover %. Include both the accessible and inaccessible portion of the condition when assigning Cover %. The subplot retains its Oc4 subplot type (##, N#).
 - B. If the access-denied subplot was not measured at Oc3, or is in condition class ≥ 2 : the subplot has a Sample Kind of 7. Record the appropriate condition class and land class data.

APPENDIX 7 -- OC1, OC2, AND OC3 10-POINT PLOT LAYOUT



APPENDIX 8A -- HELLO LETTER

**United States
Department of
Agriculture**

**Forest
Service**

**Pacific
Northwest
Research
Station**

**Forestry Sciences Laboratory
P.O. Box 3890
Portland, Oregon 97208
(503) 808-2000**

File Code: 4810

Date: Summer 1998

To Whom It May Concern:

Hello, we are researchers from the USDA Forest Service, Pacific Northwest Research Station. We are obtaining information on the forest resources of Oregon from measurements taken on a large number of randomly located sample plots on forest land. We are visiting one of these plots in this general vicinity today.

We locate each plot from a sample selected on an aerial photograph. While at the site we record information pertaining to the type of terrain; tree species, heights, and diameters; insect and disease damage; mortality and regeneration; and the amount and kind of understory vegetation. Many of our field plots were first established in the early 1960's and have been revisited on a 10-year cycle.

With the measurements we take, analysts will develop basic information about the amount, condition, and change in Oregon's forest resource. Published reports contain data on forest land area and ownership, timber volume, forest growth, mortality and cut, potential productivity, and opportunities for silvicultural treatment.

If you are interested in learning more about our research plans, or care to see publications from previous inventories similar to this one, please contact Dale Baer (503) 808-2052 by telephone or by writing to:

Portland Forestry Sciences Laboratory
Pacific Resource Inventory, Monitoring,
and Evaluation Program
P.O. Box 3890
Portland, OR 97208-3890

Sincerely,

DALE R. BAER
Supervisory Forester, Pacific Resource
Inventory, Monitoring and Evaluation

APPENDIX 8B -- LANDOWNER CONTACT LETTER

United States
Department of
Agriculture

Forest
Service

Pacific
Northwest
Research
Station

Forestry Sciences Laboratory
P.O. Box 3890
Portland, Oregon 97208
(503) 808-2000

File Code: 4810

Date:

«OWN_NAME»
«ADDRESS_LINE_1»
«ADDRESS_LINE_2»
«ADDRESS_LINE_3»

Dear «OWN_NAME»:

The Pacific Northwest Research Station located in Portland, Oregon is reinventorying forest lands in Oregon to gain basic information used by researchers and the public. This information will help answer questions concerning the amount, condition and trends of Oregon's forest resources.

Data are collected every 10 years from permanent inventory plots located on a grid across Oregon. Most of these inventory plots were originally established in 1964 and 1969 and remeasured in 1977 and again in 1987. A few plots will be established for the first time during this 1998 inventory to expand our knowledge of the relationship between forested and non-forested lands. One of our plots falls on your land. The legal description of the location of this plot is Township «TWN», Range «RANGE», Section «SEC», «FORTY». We request your permission to access your land to measure the vegetation on this plot. We only request your permission to access your land. We do not ask you to change your management practices or for your help in taking any measurements.

Data we collect from the plot on your property are combined with other plot data from adjoining areas and counties to provide information about resource conditions in the state of Oregon. The data will not be identified in any way with your name or property and will have no bearing on your property taxes. Collected data are summarized, analyzed, and published in statistical and analytical reports for the United States, for Oregon, and for various geographic areas within Oregon and are available to the public.

Our field staff will be in your area between June 15 and September 30, 1998. If you wish, they will contact you before entering your land. We realize that working on your land is a privilege and we will respect your landowner rights at all times. We are prepared to honor special conditions that you may impose upon us. Please return the enclosed postcard with your response. If you have any questions regarding the information in this letter please contact Tim Swedberg at (503) 808-2044, or Dale Baer at (503) 808-2052.

We will be happy to share the resource information we gather from your property should you be interested. Thank you again for your cooperation in this study. Your participation is greatly appreciated.

Sincerely,

SUSAN A. WILLITS
Program Manager
Pacific Resource Inventory, Monitoring
and Evaluation RD&A Program

Enclosure

«COUNTY» County («CNTY_CODE») Plot «SECDRY_PLT_ID_IN_CNTY»

File Code: 4810
Date:

R E L E A S E

The USDA FOREST SERVICE assumes liability, pursuant to the Federal Tort Claims Act, for any damages caused by negligence of Forest Service personnel while upon «OWN_NAME»'s property in connection with the inventory of forest resources in the State of Oregon, and «OWN_NAME» shall not be liable for injuries occurring to Forest Service personnel for any reason except the negligent or wrongful acts of «OWN_NAME» while they are on the property owned or controlled by «OWN_NAME».

SUSAN A. WILLITS
Program Manager
Pacific Resource Inventory, Monitoring
and Evaluation RD&A Program
Pacific Northwest Research Station
US Department of Agriculture

«COUNTY» County («COUNTY») Plot «SECDRY_PLT_ID_IN_CNTY»

APPENDIX 9 -- GLOSSARY

ACRE:	A UNIT OF LAND CONTAINING 43,560 SQUARE FEET OF AREA. 0.4 HECTARE.
AGE AT BREAST-HIGH	THE NUMBER OF ANNUAL GROWTH RINGS BETWEEN THE BARK AND THE CENTER OF THE TREE AT 1.37 METERS ABOVE THE ROOT COLLAR ON THE BOLE OF A TREE.
ASPECT	THE DIRECTION A SLOPE FACES.
AZIMUTH:	ANGLE OR DIRECTION FROM 1 TO 360 DEGREES. THE AZIMUTH PLUS 180 DEGREES IS THE BACK AZIMUTH.
BASAL AREA:	(A) OF A TREE: THE CROSS SECTIONAL AREA OF A TREE AT BREAST HEIGHT ON THE STEM. (B) OF A FOREST OR STAND: THE CROSS-SECTIONAL AREA AT BREAST HEIGHT OF ALL TREES WITHIN A UNIT OF AREA.
BASAL AREA FACTOR (BAF):	THE BASAL AREA PER UNIT OF AREA CORRESPONDING WITH A GIVEN CRITICAL ANGLE IN VARIABLE-RADIUS PLOT SAMPLING.
BOLE:	TRUNK OR MAIN STEM OF A TREE.
BORDERLINE TREE:	A TREE THAT IS AT OR NEARLY AT THE LIMITING DISTANCE ASSOCIATED WITH A GIVEN BASAL AREA FACTOR. BORDERLINE TREES REQUIRED PRECISE CHECKING TO DETERMINE IF THEY ARE TO BE SAMPLED.
BREAST HEIGHT:	THE STANDARD HEIGHT, 1.37 METERS ABOVE GROUND LEVEL, AT WHICH DIAMETER OF A STANDING TREE OR SNAG IS MEASURED. ON SLOPING GROUND, BREAST HEIGHT IS MEASURED ON THE UPHILL SIDE OF THE BOLE.
CANKER:	LOCALIZED INJURY TO STEM, BRANCH OR ROOT; CAUSED BY DISEASE OR INSECTS.
CANOPY:	THE COVER OF FOLIAGE FORMED BY TREE CROWNS.
CANOPY CLOSURE	THE PERCENTAGE OF GROUND AREA COVERED BY THE VERTICALLY PROJECTED CROSS-SECTIONS OF TREE CROWNS
CENSUS WATER:	PERMANENT AREAS OF WATER MORE THAN 1.8 HECTARES OR WIDER THAN 61 METERS.
CHAIN:	A UNIT OF LENGTH 20 METERS LONG (66 FEET).
COARSE WOODY DEBRIS:	DEAD TREE BOLES, LIMBS, AND OTHER WOODY PIECES THAT HAVE BEEN SEVERED FROM THEIR ORIGINAL SOURCE OF GROWTH OR HAVE BEEN UPROOTED. PIECES MUST BE ≥ 12.5 CM. IN DIAMETER AT THE POINT OF TRANSECT INTERSECTION, ≥ 1 METER IN LENGTH, ≥ 12.5 CM. IN DIAMETER ALONG THAT LENGTH AND IN DECAY 1 THROUGH 4 TO BE SAMPLED.
CONDITION CLASS	CONDITION CLASS IS DEFINED BY DIFFERENCES IN LAND CLASS, AND ON FOREST LAND, BY DIFFERENCES IN BROAD FOREST TYPE, STAND SIZE, TREE STOCKING, AND HARVEST ACTIVITY SINCE 0C3.

CONIFER:	CONE-BEARING TREES, MOSTLY EVERGREENS, WITH NEEDLE OR SCALE-LIKE LEAVES BELONGING TO THE BOTANICAL GROUP GYMNOSPERMAE. ALSO REFERRED TO AS SOFTWOODS.
CONK:	THE FRUITING BODY OF A WOOD-DESTROYING FUNGUS WHICH PROJECTS FROM THE TRUNK, ROOTS OR OTHER TREE PARTS.
CROOK:	ABRUPT BEND OR CURVATURE IN THE BOLE OF A TREE; A CROOK IS A SOUND CULL DEDUCTION FROM GROSS MERCHANTABLE VOLUME.
CROWN:	THE PORTION OF A TREE CARRYING THE MAIN BRANCH SYSTEM AND FOLIAGE.
CROWN CLASS:	THE SOCIAL POSITION OF A TREE RELATIVE TO ITS ABILITY TO RECEIVE DIRECT SUNLIGHT.
CROWN RATIO:	THE PERCENT OF A TREE'S TOTAL HEIGHT WHICH HAS A LIVE CROWN.
CULL:	(A) TREES OR LOGS, OR PORTIONS OF LOGS THAT ARE OF MERCHANTABLE SIZE BUT ARE UNUSABLE FOR INDUSTRIAL WOOD PRODUCTS DUE TO DEFECTS (ROT OR FORM). (B) TO CULL A LOG OR PORTION OF A LOG WITH RESPECT TO GROSS MERCHANTABLE VOLUME (C) THE DEDUCTION MADE FROM GROSS VOLUME OF A TREE OR LOG TO ADJUST FOR SOUND OR ROTTEN DEFECTS.
CULL OTHER:	PERCENTAGE DEDUCTION OF VOLUME LOST DUE TO BROKEN OR MISSING PARTS, FORKS OR CROOKS.
CULL ROT:	LOSS OF GROSS MERCHANTABLE VOLUME DUE TO ROT. VISUALLY INDICATED BY CONKS, ROTTEN SEAMS, ETC., CODED AS A CATEGORY OF PERCENTAGE OF VOLUME AFFECTED BY THE ROT.
CULTURAL NONFOREST STRINGER:	NONFOREST AREA OF CONSTRUCTED ROADS, RAILROADS, POWER-LINES, PIPELINES, AND CANALS WHICH ARE 0.4 HECTARES OR LARGER WITH NO MINIMUM WIDTH REQUIREMENT.
CULTURALLY-KILLED TREE:	A TREE TALLIED OR RECONSTRUCTED AS LIVE AT OC3 BUT SINCE KILLED BY DIRECT HUMAN ACTIVITY AND NOT UTILIZED. THE TREE CAN BE STANDING, DOWNED, OR FELLED. INCLUDED ARE TREES KILLED BY LOGGING INJURY AND STILL STANDING. A TREE IS CULTURALLY-KILLED ONLY IF IT SHOWS NO SIGN OF LIFE OR IS PARTIALLY UPROOTED, LIVE, AND LEANS ≥ 45 DEGREES. NOT TALLIED ON N# SUBPLOTS.
CWD:	SEE COARSE WOODY DEBRIS.
D.B.H.:	DIAMETER BREAST HEIGHT: THE TREE DIAMETER MEASURED AT BREAST HEIGHT--1.37 METERS ABOVE GROUND LEVEL.
DEAD TREE:	A TREE TALLIED OR RECONSTRUCTED AS LIVE AT OC3 BUT NOW DEAD. DEATH WAS NATURAL AND NOT DUE TO DIRECT HUMAN ACTIVITY. A TREE IS DEAD ONLY IF IT SHOWS NO SIGH OF LIFE OR IS PARTIALLY UPROOTED, LIVE, AND LEANS ≥ 45 DEGREES. NOT TALLIED ON N# SUBPLOTS.

DEFOLIATOR:	AN INSECT, WHICH FEEDS UPON, OR STRIPS LEAVES AND NEEDLES FROM TREES.
EVEN-AGED STAND:	A STAND IN WHICH INDIVIDUAL TREES ORIGINATED AT APPROXIMATELY THE SAME TIME. SPECIFICALLY, THE STAND MUST NOT BE CLASSIFIED AS NONSTOCKED, AND AT LEAST 70 PERCENT OF THE LIVE TREES PRESENT MUST BE WITHIN 30 YEARS OF ONE ANOTHER IN TOTAL AGE.
FIELD GRID LOCATION:	THE CENTER OF SUBPLOT 1 ON THE STANDARD PLOT LAYOUT. THE FIELD GRID LOCATION IS PINPRICKED ON OC3 PLOT PHOTOS IF THE PLOT WAS VISITED AT OC3; THIS INCLUDES ESTABLISHED PLOTS THAT CAN'T BE FOUND AT OC4. THE FIELD GRID LOCATION IS PINPRICKED ON THE OC4 PHOTOS FOR PLOTS THAT WERE NOT VISITED AT OC3.
FIXED-RADIUS PLOT:	A CIRCULAR SAMPLED AREA WITH A SPECIFIED RADIUS IN WHICH ALL TREES OF A GIVEN SIZE, SHRUBS, OR OTHER ITEMS ARE TALLIED.
FORB:	A BROAD-LEAVED HERBACEOUS PLANT AS DISTINGUISHED FROM GRASSES, SHRUBS AND TREES.
FOREST TYPE:	CLASSIFICATION OF A FOREST SITE BASED ON THE TREE SPECIES PRESENT THAT MOST DOMINANTS THE GROWING SPACE OF THE SITE.
GLC:	GROUND LAND CLASS.
GROUND LAND CLASS:	A CLASSIFICATION OF LAND BY USE. THE MINIMUM AREA FOR CLASSIFICATION IS 0.4 HECTARE. EACH MAPPED CONDITION CLASS REQUIRES A GROUND LAND CLASS.
HARDWOODS:	BROAD-LEAVED AND DECIDUOUS TREES AS OPPOSED TO HAVING NEEDLES. TREES BELONGING TO THE BOTANICAL GROUP ANGIOSPERMAE. TREE SPECIES CODES >299.
HARVESTED TREE:	A TREE TALLIED OR RECONSTRUCTED AS LIVE AND >12.5 CM D.B.H. AT OC3 BUT SINCE HARVESTED FOR INDUSTRIAL SUPPLY, FIREWOOD, LOCAL USE, OR INCIDENTAL REASONS. NOT TALLIED ON N# SUBPLOTS.
HEARTWOOD:	THE INNER, NONLIVING CORE OF WOOD IN A TREE BOLE, GENERALLY DARKER THAN SAPWOOD.
HECTARE:	A METRIC UNIT OF AREA EQUAL TO 10,000 SQUARE METERS. 2.47 ACRES.
INCREMENT:	THE INCREMENT IN D.B.H. OF A TREE IN A SPECIFIED PERIOD OF TIME.
INGROWTH TREE:	A TREE THAT HAS GROWN PAST A DIAMETER THRESHOLD ON A FIXED-RADIUS PLOT SINCE PREVIOUS INVENTORY.
LIMITING DISTANCE:	THE SET OF DISTANCES FOR A SPECIFIED BASAL AREA FACTOR WHICH DETERMINES WHETHER A TREE IS IN OR OUT OF THE

	SAMPLE. THE DISTANCE IS THE PRODUCT OF THE TREE'S DBH MULTIPLIED BY THE PLOT RADIUS FACTOR. THE PLOT RADIUS FACTOR IN WESTERN OREGON IS 0.18896.
MAI:	MEAN ANNUAL INCREMENT. MAI IS THE AVERAGE ANNUAL GROWTH OF A FULLY STOCKED STAND AT A SPECIFIED AGE.
MORTALITY TREE:	SEE DEAD TREE.
MYCELIUM:	THE VEGETATIVE PART OF A FUNGUS; A MASS OF THREAD-LIKE FILAMENTS.
NECK	A NECK IS LESS THAN 35 METERS IN LENGTH. A NECK CAN BE LESS THAN 35 METERS WIDE TO BE IDENTIFIED WITH THE CONDITION CLASS TO WHICH IT IS ATTACHED.
NONFOREST INCLUSION:	AN AREA THAT IS NONFOREST BUT LESS THAN 0.4 HECTARE IN SIZE. WHEN PART OR ALL OF A FIXED OR VARIABLE-RADIUS PLOT FALLS WITHIN A NONFOREST INCLUSION, THE INCLUSION IS SAMPLED AS PART OF THE SURROUNDING FOREST LAND.
NONSTOCKABLE:	A FOREST LAND CONDITION CLASS IS NONSTOCKED IF: 1) THE AVERAGE DIAMETER OF LIVE TREES IN THE CONDITION CLASS IS <12.5 CM. D.B.H. AND <100 FREE-TO-GROW SEEDLINGS AND SAPLINGS PER ACRE ARE DISTRIBUTED BROADLY ACROSS THE CONDITION CLASS. OR: 2) THE AVERAGE DIAMETER OF LIVE TREES IN THE CONDITION CLASS IS >12.5 D.B.H. AND TREE CANOPY COVER IS < 10 PERCENT. OR: 3) THE CONDITION CLASS WAS RECENTLY CLEARCUT AND HAS NOT BEEN REPLANTED.
Oc1:	THE INVENTORY OF 1964 (CENTRAL UNIT) AND 1969 (BLUE MOUNTAIN UNIT).
Oc2:	THE INVENTORY OF 1977.
Oc3 :	THE INVENTORY OF 1986-87 (CENTRAL UNIT) AND 1987 (BLUE MOUNTAIN UNIT).
Oc4:	THE CURRENT INVENTORY.
PASTURE:	PASTURE IS RANGELAND THAT HAS BE PLOWED AND ARTIFICIALLY SEEDED TO GRASS OR OTHER FORAGE SPECIES LIKE CLOVER TO FEED DOMESTIC LIVESTOCK. OFTEN, IT IS IRRIGATED AND FENCED.
PC:	PLOT CENTER. THE FIELD GRID LOCATION ON THE GROUND FOR EACH FIELD PLOT. ON ESTABLISHED PLOTS VISITED AT OC3, PLOT CENTER IS AT THE OC3 CEDAR STAKE. ON MISSING OR LOST PLOTS, PLOT CENTER IS THE PINPRICKED LOCATION ON THE OC3 PLOT PHOTOS. ON NEW PLOTS, PLOT CENTER IS THE PINPRICKED LOCATION ON THE OC4 PLOT PHOTOS.
PI:	PHOTO INTERPRETATION.
POLETIMBER:	A TREE 12.5 TO 22.4 CM. D.B.H.
POLETIMBER STAND	A STAND IN WHICH THE AVERAGE DIAMETER OF THE TREES PRESENT IS 12.5 TO 22.4 CM. D.B.H.

PLANT INDICATOR	A PLANT SPECIES USED IN PREDICTING THE STOCKING CAPACITY OF A FOREST LAND SITE.
RANGELAND:	LAND DOMINATED BY NATURAL PLANT COVER COMPOSED PRINCIPALLY OF NATIVE OR EXOTIC GRASSES, FORBS, OR SHRUBS. NATURAL RANGELAND IS UNIMPROVED, I.E., IT IS NOT IRRIGATED, AND HAS NOT BEEN SEEDED ARTIFICIALLY.
REGENERATION:	A YOUNG, PRECOMMERCIAL-SIZED STAND, OR THE UNDERSTORY TREE COMPONENT OF A MULTISTORIED STAND.
RELEASE:	FREEING A TREE FROM IMMEDIATE COMPETITION BY REMOVING OTHER TREE OR NONTREE COMPETITION.
RESIDUAL OVERSTORY:	A TREE THAT HAS SURVIVED FROM THE PREVIOUS STAND AND IS USUALLY LARGER OR OLDER THAN TREES WHICH ORIGINATED AS PART OF THE PRESENT STAND.
ROT:	DECAY. DECOMPOSITION OF WOOD BY FUNGI OR BACTERIA.
ROUNDWOOD:	SECTIONS OF TREE STEMS, WITH OR WITHOUT BARK. INCLUDES LOGS, BOLTS, POSTS, PILINGS AND OTHER PRODUCTS STILL "IN THE ROUND".
RP:	REFERENCE POINT. AN OBJECT (USUALLY A TREE) WHICH CAN BE LOCATED ON THE GROUND AND IDENTIFIED ON THE PHOTO. IT WILL BE TAGGED AND REFERENCED TO THE CEDAR STAKE IN ORDER TO FACILITATE RELOCATING THE PLOT.
SAPLING:	A TREE 2.5 TO 12.4 CM. D.B.H.
SAPWOOD:	THE OUTER LAYERS OF WOOD BETWEEN THE HEARTWOOD AND INNER BARK. GENERALLY LIGHTER IN COLOR THAN HEARTWOOD.
SAWTIMBER STAND, SMALL	A STAND IN WHICH THE AVERAGE DIAMETER OF THE LIVE TREES PRESENT IS 22.5 TO 52.4 CM. D.B.H.
SAWTIMBER STAND, LARGE	A STAND IN WHICH THE AVERAGE DIAMETER OF THE LIVE TREES PRESENT IS GREATER THAN 52.4 CM. D.B.H.
SDI	STAND DENSITY INDEX.
SEEDLING:	A LIVE TREE LESS THAN 2.5 CM. D.B.H. THAT IS AT LEAST 15 CM. IN HEIGHT AND ESTABLISHED IN MINERAL SOIL.
SEEDLING-SAPLING STAND	A STAND IN WHICH THE AVERAGE DIAMETER OF THE LIVE TREES PRESENT IS LESS THAN 12.5 CM. D.B.H.
SILVICULTURE:	THE SCIENCE AND PRACTICE OF GROWING AND TENDING FOREST CROPS FOR SPECIFIED OBJECTIVES.
SITE:	THE AGGREGATE OF ALL ENVIRONMENTAL CONDITIONS AFFECTING THE SURVIVAL AND GROWTH OF A PLANT COMMUNITY ON A SPECIFIC AREA.
SITE CLASS:	A CLASSIFICATION OF POTENTIAL AVERAGE ANNUAL ABILITY OF A FOREST LAND SITE TO PRODUCE WOOD--FOR THE PERIOD BETWEEN THE TIME OF STAND ESTABLISHMENT AND THE TIME

	WHEN AVERAGE ANNUAL WOOD PRODUCTION PEAKS-- WERE THE SITE FULLY STOCKED WITH DESIRABLE TREES.
SITE INDEX:	A MEASURE OF PRODUCTIVITY INHERENT ON A FOREST SITE THAT IS SIMPLE NUMERICAL VALUE BASED UPON TREE HEIGHT AT A SPECIFIED AGE.
SNAG:	A STANDING DEAD TREE. IN THE CURRENT INVENTORY, A SNAG MUST BE ≥ 12.5 CM DBH AND ≥ 2 METERS TALL, LEAN LESS THAN 45 DEGREES FROM VERTICAL AND NOT SEVERED FROM ITS ROOTSTOCK NOR UPROOTED. A SNAG MAY BE EITHER SELF-SUPPORTED BY ITS ROOTS, OR SUPPORTED BY ANOTHER TREE OR SNAG.
SOFTWOODS:	CONIFEROUS TREES, USUALLY EVERGREEN, HAVING NEEDLE OR SCALE-LIKE LEAVES.
STAND AGE:	THE TOTAL AGE OF A FOREST STAND THAT BEST CHARACTERIZED THE STAND. STANDS ARE EVEN- OR UNEVEN-AGED.
STANDING DEAD TREE:	SEE SNAG.
STAND DENSITY INDEX:	THE MAXIMUM NUMBER OF TREES PER UNIT AREA A FOREST SITE WILL SUPPORT WHEN THE STAND D.B.H. IS 10 INCHES RELATIVE TO THE MAXIMUM EXPECTED NUMBER IF THE SITE WERE CAPABLE OF SUPPORTING A NORMAL STAND.
STAND SIZE:	A CLASSIFICATION OF STANDS BASED ON TREE SIZE. STAND SIZES ARE LARGE SAWTIMBER, SMALL SAWTIMBER, POLETIMBER, AND SEEDLING-SAPLING STANDS. IF LESS THAN 10 PERCENT STOCKED WITH LIVE TREES, THE SITE IS CALLED NONSTOCKED.
STOCKABILITY INDICATOR:	A PLANT SPECIES OR ABIOTIC ATTRIBUTE USED TO PREDICT THE STOCKING CAPACITY OF A FOREST SITE.
STOCKABILITY PROBLEM:	A FOREST SITE NOT CAPABLE OF SUPPORTING THE TREE DENSITY EXPECTED IF THE SITE COULD SUPPORT A NORMAL, FULLY STOCKED STAND.
STOCKING:	A QUALITATIVE EXPRESSION BASED ON COMPARING THE EXISTING NUMBER OF TREES PRESENT ON A FOREST SITE TO THE NUMBER NEEDED TO ACHIEVE THE MOST OPTIMAL GROWTH, VOLUME, OR VALUE POSSIBLE ON THE SITE.
STRINGER:	A STRINGER IS AT LEAST 35 M. LONG. TO BE IDENTIFIED WITH THE CONDITION CLASS TO WHICH IT IS ATTACHED, IT MUST ALSO BE 35 M. WIDE.
SUNSCALD:	DAMAGE TO THE CAMBIUM CAUSED BY OVEREXPOSURE TO SUN .
SWEEP:	A BROAD ARC IN A BOLE OR LOG. A SOUND CULL DEFECT.
TERMINAL LEADER:	THE TOPMOST SHOOT OF A TREE.
TRACHEID:	PART OF WOOD STRUCTURE: A LONG, TUBELIKE CELL IN WOOD TISSUE.

TRACKABLE TREE:	A SAMPLED TREE THAT IS REFERENCED AND REMEASURED IN SUCCESSIVE INVENTORIES ON PERMANENT PLOTS.
UNEVEN-AGED STAND:	A STAND THAT IS NOT CLASSIFIED AS NONSTOCKED AND THAT HAS LESS THAN 70 PERCENT OF THE TREES PRESENT WITHIN 30 YEARS OF ONE ANOTHER IN TOTAL AGE.
VARIABLE-RADIUS PLOT:	A PLOT ON WHICH TREES ARE SELECTED FOR MEASUREMENT ACCORDING TO SIZE RATHER THAN BY THE FREQUENCY OF THEIR OCCURRENCE. THE LARGER THE DIAMETER OF A TREE THE FARTHER FROM PLOT CENTER IT CAN BE AND STILL BE SAMPLED.
WILT:	DROOPING OF FOLIAGE; OFTEN A DISEASE SYMPTOM.

APPENDIX 10A -- CHECK PLOTS

A. Objectives: Check plots are performed for several purposes:

1. To assess the accuracy of collected data;
2. To ensure that documented field plot instructions and accuracy standards are uniformly understood and consistently followed;
3. To assess the ability of individual crew members.

B. Check plot policies: The following policies for conducting check plots will be followed:

1. Each person will be checked within the first two weeks of field work and will accompany the checkplotter to the check plot.
2. Check plots will continue during the entire season; each person is checked 4-5 times during the field season.
3. All check plot items count equally for each person who did the plot.

C. Check plot procedures:

1. In the field, the check plotter checks all tree classifications and measurements. The check plotter or one of the crew members who originally did the plot makes all of the tree measurements during the check plot visit. These check measurements are compared to the original measurements recorded on the data recorder hardcopy. Items that do not meet accuracy standards are rechecked. Final decisions on accuracy rest with the check plotter. Errors are circled in red on the original tally sheet, and the correct value written near the circle.

2. Completing the check plot form. Field plot items are organized into 16 categories on the check plot form. The percent correct in each of the categories is calculated by dividing the number of correct items by the total number of items.

Each category is rated as (1) outstanding, (2) acceptable, or (3) unacceptable. These ratings are based on the accuracy standards indicated on the check plot form.

APPENDIX 10B -- CHECK PLOT FORMS

County _____ Plot # _____ Crew _____ Date _____
 Checked by _____ Date _____

1. PLOT LOCATION

To receive Outstanding:

- (A) If remeasured, the plot must be relocated. (B) If new the plot must be within type and +/- 5m
 (C) Total = 100%

To receive Acceptable:

- (A) If remeasured, the plot must be relocated, or (B) If new, the plot must be within +/- 10m.
 (C) Total $\geq 90\%$

	# Correct/Out of
a.) Remeasured-relocated	_____
b.) New-correctly located	_____
c.) Oc 3, and 4 pinpricks in same correct spot and labeled	_____
d.) RP tagged, pinpricked, labeled and described	_____
e.) RP azimuth +/- 4 degrees, distance-plot must be findable 10 yrs from now (judgment of checkers) and +/- 5% ..	_____
Total	_____ %

2. PLOT LAYOUT

To receive Outstanding:

- (A) All subplots correctly numbered, and (B) All condition class boundaries correctly drawn, and
 (C) Total = 100%

To receive Acceptable:

- (A) Total $\geq 95\%$

	# Correct/Out of
a.) Subplots correctly numbered	_____
b.) Diagram accurate, condition class boundaries correct	_____
c.) References tagged and recorded. Az +/- 4 degrees, distances +/- 20cm (total = 8 per subplot)	_____
Total	_____ %

3. TRACKABLE TREE PRISM TALLY

To receive Outstanding: 100% To receive Acceptable: $\geq 98\%$

	# Correct/Out of
a.) Prism tally	_____
Total	_____ %

4A. TRACKABLE TREE FIXED-RADIUS TALLY: SAPLINGS

To receive Outstanding: 100% To receive Acceptable: $\geq 98\%$

	# Correct/Out of
a.) Fixed radius tally	_____
Total	_____ %

4B. TRACKABLE TREE FIXED-RADIUS TALLY: SEEDLINGS

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $<95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Fixed-radius tally	_____
b.) Selection rules followed	_____
Total	_____ %

5. SITE TREE SELECTION and PLANT COMMUNITY

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $<95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Site tree selection fits model for each tree	_____
b.) Site tree height and age meet standards	_____
c.) Plant community correctly classified	_____
Total	_____ %

6. TREE HISTORY AND SPECIES

To receive Outstanding: 100% To receive Acceptable: $\geq 98\%$

	# Correct/Out of
a.) Tree condition class and history	_____
b.) Tree species	_____
Total	_____ %

7. HEIGHT AND DBH-TRACKABLE TREES

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $<95\%$ and $\geq 88\%$

	# Correct/Out of
a.) Height normally formed up to 20m tall +/- 1m	_____
b.) Height normally formed >20m tall +/- 4%	_____
c.) Dbh +/- 2 mm per 50cm	_____
Total	_____ %

8. SNAG TALLY

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $< 95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Snag tally	_____
b.) Dbh decay class 1, 2 +/- 2cm; decay class 3,4,5, +/-4cm	_____
c.) Height--same as trees	_____
d.) Use or disappearance correct	_____
e.) Decay class +/- 1 class	_____
Total	_____ %

9. CONDITION CLASS

To receive Outstanding: 100% To be acceptable: $\geq 95\%$
To receive Outstanding or Acceptable (a) and (f) must be 100%

	# Correct/Out of
a.) Condition class correctly recognized	_____
b.) Condition classes mapped on 16.95-m subplot diag. correctly	_____
c.) Az. +/- 4 degrees; Distances +/- .5 m to distinct boundary	_____
d.) Percent of subplot in each condition class +/- 5%	_____
e.) Sample kind of each condition class	_____
f.) Ground land class of each condition class	_____
g.) Forest type, stand size, stand age (+/- 5 years in even-aged stands <40 years old; otherwise, +/-20 years), habitat type, stand condition	_____
Total	_____ %

10. TREE IDENTIFICATION AND CLASSIFICATION

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $< 95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Height estimates in trees with missing parts +/- 2m	_____
b.) Dbh nail height +/- 3cm, 2 or more nails in 75cm + trees	_____
c.) Age-bored +/- 2 yr, estimated +/- 10%	_____
d.) Crown ratio +/- 1 class	_____
e.) Crown class: free to grow or not*	_____
f.) Damaging agent or harvest code correct	_____
g.) Mistletoe recognized +/- 2	_____
h.) Cull other recognized +/- 10%.	_____
i.) Form class first 2.5 meter log straight or not**	_____
j.) Cull rot indicators correct	_____
Total	_____ %

* For crown class crew will be marked off if they do not correctly distinguish between dominant-codominant and intermediate-suppressed trees.

** For form class crew will be marked off if they do not correctly recognize that the first 2.5 meter log of the tree is straight or not.

11. VEGETATION PROFILE PLOT CLASSIFICATION

To receive Outstanding*: $\geq 95\%$ To receive Acceptable: $> 90\%$

	# Correct/Out of
a.) Tree, shrub and perennial grass species recognized*	_____
b.) Forb, annual grass species recognized	_____
c.) Total veg percent cover +/- 20%	_____
d.) Total shrub/herb/grass percent +/- 20%	_____
e.) Top 5 cover species listed in relative frequency order	_____
f.) Vegetation layer and stage of development correct	_____
g.) % bare ground +/- 20%	_____
h.) Total vegetation cover % +/- 20%	_____
Total	_____ %

* To receive an Outstanding item a). must be $\geq 98\%$

12. AREA CLASSIFICATION

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $< 95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Stream proximity +/- 5 meter, stream class correct	_____
b.) Aspect +/- 1 class	_____
c.) Slope +/- 15%.	_____
d.) Topographic position	_____
e.) Nonstockable, root rot-recognized +/- 15%	_____
f.) Plot description-land class, productivity, treatment, disease, layout, harvest, ownership class, etc addressed	_____
Total	_____ %

13. COARSE WOODY DEBRIS

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $< 95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Piece tally	_____
b.) Large and small end diameters; decay class 1,2 +/- 2cm; decay class 3,4 +/- 4cm	_____
c.) Decay Class +/- 1 class	_____
d.) Piles (shape code)	_____
e.) Length--same standards as tally trees	_____
Total	_____ %

14.CROWN COVER

To receive Outstanding*: $\geq 95\%$ To receive Acceptable: $< 95\%$ and $\geq 90\%$

	# Correct/Out of
a.) Length of total cover by layer in forested CC	_____
b.) Species correctly identified *	_____
Total	_____ %

* To receive an Outstanding item b). must be $\geq 98\%$

15. STOCKING PLOTS

To receive Outstanding: $\geq 95\%$ To receive Acceptable: $< 95\%$ and $\geq 90\%$

	# Correct/Out of
a.)Crop tree tally 5 meter radius	_____
b.)Additional tree tally 5 meter radius	_____
c.) Prism tree tally on temporary points	_____
d.) Diameter +/- 1cm	_____
e.)Height--same standards as tally trees	_____
f.) Pre-commercial thinning/stumps present	_____
g.) Inhibiting vegetation coded correctly	_____
Total	_____ %

16. OTHER ITEMS NOT PREVIOUSLY COVERED (if needed-checker's decision)

To receive Outstanding: 100% To be Acceptable $\geq 95\%$

	# Correct/Out of
a.)	_____
b.)	_____
c.)	_____
Total	_____ %

CHECK PLOT SUMMARY

OUTSTANDING
CATEGORIES

ACCEPTABLE
CATEGORIES

UNACCEPTABLE
CATAGORIES

WRITE-UP _____

APPENDIX 11 -- INSECT AND DISEASE KEYS

Root Disease Identification Aids:

General root disease symptoms

Root disease centers or "pockets" usually appear as patches or groups of dead and dying trees. Trees in all stages of decline--long-dead trees, recent kills, declining live trees--are usually present; old dead trees are found at the center of the pocket, while declining trees occur near the leading edge of the expanding infected area; in contrast, bark beetle group kills usually consist of trees that died suddenly and simultaneously. Windthrown trees with decayed roots broken off close to the root collar (root ball) may be evident, except for Black stain root disease and Annosus in pines, which do not form root balls.

Individual trees affected by root disease may exhibit the following above-ground symptoms:

1. Reduced height growth increment (as compared to neighboring healthy trees). This results from gradual decline as the root system is slowly destroyed. Look for progressively short internodes of the terminal leader.
2. Sparse, yellow crowns. Trees infected by root disease fungi often lose needles; needles that remain are often yellow (chlorotic). The crown appears "transparent".
3. Distress cone crop. In the later stages of decline, infected trees may produce an abundant crop of unusually small cones.

Individual disease descriptions:

Laminated root disease

Affects all conifers to varying degrees. the most susceptible species are Douglas-fir, true-fir, and mountain hemlock. Windthrown trees have decayed roots broken close to root collar, forming root balls. When duff and soil are removed to expose roots, look for grey-white mycelium on surface of roots; these mycelium penetrate only the outermost few millimeters of bark, forming a crusty sheath that cannot be rubbed off easily. In comparison--Armillaria will have white mycelium on the inside of roots, between the bark and wood.

Laminated root rot is most easily identified by examining decayed wood which can be found on root balls or in stump hollows. Decayed wood separates readily along annual tree growth rings, hence the name "laminated" root rot. Yellowish-brown decayed wood is usually dry and contains numerous 1 millimeter-long oval pits. Reddish-brown wiry whiskers can usually be found between layers of decayed wood and are best seen with a 10x magnifying lens. These whiskers are the best diagnostic indicator of laminated root rot.

Armillaria root disease

Affects all conifers and hardwoods. Root balls on fallen trees may occur in disease centers. Heavy resin flow near base of tree is common. Chopping into root collar or root will reveal white, fan-shaped mats of mycelium between wood and bark. The mats have a texture that may remind one of peeling partially-dry latex paint off a glass surface (if one has ever done that). The mycelium can penetrate a few millimeters into the inner bark, but never evident on the outside of the bark or root surfaces. In comparison, laminated root rot has grey-white mycelium on the outside. Decay in root balls and stumps is soft, spongy, yellowish, usually wet, stringy, and often contains numerous black lines. Honey-colored mushrooms may be present at the base of infected trees and stumps. Black thread-like structures (rhizomorphs) may be present in decaying wood or in infected roots.

Black stain root disease

Pines are the primary host in eastern Oregon. Hemlocks and Douglas-fir can also be affected. Infected trees occasionally have resin flow at the base. Brown to black streaks in the sapwood--usually in the last 3 to 4 annual rings--of the root collar and roots are the best indication of the disease. You must chop into the wood to diagnose Black stain; it does not occur in or on the bark or bole of roots. Root balls are not present in Black stain disease centers (unless an other root disease is present) because the fungus does not rot roots--it plugs sapwood tracheids causing trees to die standing. Black stain is most common in young plantations.

Annosus root disease

Most common on true firs, pine, and hemlock. Most difficult to identify of the major root diseases. Look for groups of trees that have not died all at the same time. Bark beetles usually will be present, especially in true fir, ponderosa pine, and sugar pine. Root balls may be present in disease centers, particularly in true fir stands. In true firs, the decayed wood is soft, spongy, white (often with silvery cast) with black flecks (like small wild rice grains scattered through the decay). Small bracket-shaped conks may be present in stump hollows or under the duff near the root collar of infected dead trees or stumps. Annosus is often identified by default--if it is not one of the other root diseases, and if the symptoms suggest root disease and the decay is similar to the description, then it is probably Annosus. In pines, small "button" conks may be present on the root collar beneath the duff. The roots of infected pines are usually resin-soaked.

Listing of disease-tolerant species by root disease:

<u>Root disease</u>	<u>Disease-tolerant species:</u>
Laminated root rot	larch, pines, cedars
Armillaria root disease	larch, lodgepole pine. On a few sites, ponderosa pine may be susceptible. If this is the case, only larch and lodgepole should be considered tolerant.
Annosus root disease	On sites with abundant true fir, lodgepole and ponderosa pines are tolerant. On ponderosa pine sites, larch and Douglas-fir are tolerant.

Insect and disease identification aids

9 pages of color insect and disease photos included in field-going version of manual only.

1998 Eastern Oregon Timberland Field Manual

9 pages of color insect and disease photos included in field-going version of manual only.

APPENDIX 12 -- TREE VOLUME TABLES

Species..... WESTERN HEDGECOCK (*Tsuga heterophylla*)
 Unit of measure..... Board-foot
 Variables..... D.b.h. and total height
 Log rule..... Scribner
 Scaling length for logs, 16 feet
 Stump height..... 2 feet
 Top d.i.b..... 8 inches
 Trim allowance per log, 0.3 feet
 Method..... Alignment chart
 Number of trees..... 1,461
 Location of trees..... Young and old stands in Oregon and Washington
 Accuracy..... Aggregate deviation 0.06 percent low
 Author..... W.H. Meyer, Pacific Northwest Forest and Range Expt. Sta.
 Source..... Table 48 in U. S. Dept. Agr. Tech. Bul. 564
 Year..... 1937
 Note..... Values for odd d.b.h.'s added in 1953

D.b.h. (inches)	Volume in tens of board-feet when total height of tree in feet is--																			
	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
12	8	10	12	14	15	17	19	20	22	23	24	26	27	28	29	30	31	32	33	34
13	10	12	14	16	17	19	21	23	25	27	29	30	33	34	35	36	37	38	39	40
14	12	15	18	20	23	25	27	30	32	33	37	40	41	42	43	44	45	46	47	48
15	14	17	21	24	27	30	32	35	38	41	44	47	48	49	50	51	52	53	54	55
16	17	20	24	28	32	35	38	41	44	48	52	55	59	63	67	71	74	77	80	83
17	19	23	28	32	37	40	44	47	51	56	59	63	67	72	77	81	85	89	93	97
18	22	27	32	37	42	46	50	54	58	64	67	71	76	81	86	90	94	98	102	106
19	25	30	36	41	47	52	56	61	65	71	75	79	84	91	97	101	105	109	113	117
20	28	34	40	46	52	58	63	68	73	79	83	87	93	100	107	113	118	123	128	133
21		38	44	51	58	64	70	75	81	87	92	97	103	109	116	122	128	134	140	145
22		42	49	56	64	71	77	83	90	96	101	107	113	119	125	132	138	144	150	156
23			54	62	70	77	84	91	98	105	111	117	124	130	137	144	150	156	162	168
24			60	68	76	84	92	99	107	114	121	128	135	142	150	157	163	170	176	182
25				74	82	91	100	108	116	124	131	139	147	155	165	172	178	185	192	198
26				80	89	98	108	117	125	134	142	150	159	168	180	187	194	201	208	215
27					96	106	116	126	135	144	153	162	172	182	194	203	210	217	224	231
28					104	114	124	135	145	155	165	175	186	197	209	222	227	234	241	248
29					112	122	132	144	153	166	177	188	199	211	224	235	244	252	260	267
30					120	130	141	153	163	177	189	201	213	225	239	250	262	272	282	291
31					127	138	150	163	175	188	201	209	227	240	254	266	279	290	301	311
32					135	147	160	173	186	200	214	218	241	255	270	282	296	310	324	337
33						155	169	183	198	209	227	237	256	271	286	300	314	329	343	357
34						163	178	194	210	215	240	256	271	287	303	318	333	348	363	377
35							205	221	232	254	271	287	303	319	335	351	366	382	397	412
36							216	233	250	268	286	303	319	336	353	370	385	401	417	433
37								246	264	283	301	319	335	354	371	389	405	421	437	453
38								259	278	298	316	336	352	372	390	408	425	442	459	476
39								271	291	312	331	351	370	389	408	427	444	462	480	498
40								283	304	326	347	367	387	407	427	446	464	483	503	522
41								296	318	341	363	383	403	426	446	465	484	504	524	544
42								310	332	356	379	400	420	445	465	485	505	525	545	565
43								323	349	371	394	417	437	462	482	505	527	547	572	592
44								337	367	387	410	435	455	480	500	525	550	570	595	617
45								350	378	401	425	450	472	497	520	545	570	592	617	640
46								363	390	415	440	465	490	515	540	565	590	615	640	660
47								376	405	430	457	482	507	535	560	585	612	637	665	685
48								390	420	445	475	500	525	550	580	605	635	660	690	712
49								402	432	460	490	517	545	575	600	625	655	682	712	735
50								415	445	475	505	535	565	595	620	645	675	705	735	760
51									490	522	552	582	612	640	667	697	727	760	785	810
52									505	540	570	600	630	660	690	720	750	785	810	835
53									522	557	587	617	650	680	712	742	775	810	835	860
54									540	575	605	635	670	700	735	765	800	835	865	890
55									555	590	622	652	690	720	755	785	822	855	890	915
56									570	605	640	670	710	740	775	810	845	885	915	940
57									585	622	657	690	730	762	797	832	870	907	935	960
58									600	640	675	710	750	785	820	855	895	930	960	990
59									615	655	692	725	767	802	837	875	912	955	985	1015
60									630	670	710	740	785	820	855	895	930	970	1005	1040

Species.....Douglas-fir (Pseudotsuga menziesii), young-growth
 Unit of measurement.....Board-foot
 Basis.....D.b.h. and total height
 Log rule.....Sawyer
 Scaling length for logs.....16 feet
 Stump height.....2 feet
 Top d.b.h.....6 inches
 Tilt allowance per log.....0.3 feet
 Method of trees.....Board-feet per cubic-foot ratios applied to table 12 in U. S. Dept. Agr. Tech. Bul. 201
 Number of trees.....1,432
 Location of trees.....Western Oregon and western Washington
 Accuracy.....Aggregate deviation 0.1 Percent High
 Author.....R. S. Macfarlane, Pacific Northwest Forest and Range Expt. Sta.
 Source.....Table 14 in U. S. Dept. Agr. Tech. Bul. 201
 Year.....1930

D.b.h. (inches)	Board-foot volume when total height of tree in feet is—																							
	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280
12	32	50	69	87	105	124	140	159	176	196	215	235	255	275	295	315	335	355	375	395	415	435	455	475
13	39	61	83	107	130	150	170	190	212	238	265	292	319	346	373	400	427	454	481	508	535	562	589	616
14	47	76	101	129	155	179	201	225	252	282	310	338	366	394	422	450	478	506	534	562	590	618	646	674
15	56	88	118	148	180	207	233	262	290	324	354	384	414	444	474	504	534	564	594	624	654	684	714	744
16	66	100	136	170	205	235	265	296	330	368	400	432	464	496	528	560	592	624	656	688	720	752	784	816
17	76	115	154	193	230	263	296	331	370	412	450	488	526	564	602	640	678	716	754	792	830	868	906	944
18	86	129	174	213	259	294	329	367	410	458	508	554	600	646	692	738	784	830	876	922	968	1014	1060	1106
19	96	142	192	239	283	315	353	393	440	492	548	604	660	716	772	828	884	940	996	1052	1108	1164	1220	1276
20	106	157	212	262	311	349	397	440	496	554	612	670	728	786	844	902	960	1018	1076	1134	1192	1250	1308	1366
21	116	171	230	283	336	379	430	480	538	598	658	718	778	838	898	958	1018	1078	1138	1198	1258	1318	1378	1438
22	126	184	246	303	360	407	462	516	574	634	694	754	814	874	934	994	1054	1114	1174	1234	1294	1354	1414	1474
23	136	197	263	324	385	437	496	554	616	680	744	808	872	936	1000	1064	1128	1192	1256	1320	1384	1448	1512	1576
24	146	210	280	345	410	467	528	588	652	718	784	850	916	982	1048	1114	1180	1246	1312	1378	1444	1510	1576	1642
25	156	222	296	365	435	497	562	628	696	766	836	906	976	1046	1116	1186	1256	1326	1396	1466	1536	1606	1676	1746
26	166	235	313	386	460	525	594	664	736	810	884	958	1032	1106	1180	1254	1328	1402	1476	1550	1624	1698	1772	1846
27	176	249	331	408	486	555	628	704	780	858	936	1014	1092	1170	1248	1326	1404	1482	1560	1638	1716	1794	1872	1950
28	186	264	350	432	514	587	664	744	824	908	992	1076	1160	1244	1328	1412	1496	1580	1664	1748	1832	1916	1999	2083
29	196	279	369	456	542	620	702	788	874	964	1054	1144	1234	1324	1414	1504	1594	1684	1774	1864	1954	2044	2134	2224
30	206	294	389	480	570	652	738	828	918	1014	1108	1204	1300	1396	1492	1588	1684	1780	1876	1972	2068	2164	2260	2356
31	216	307	406	500	594	680	770	864	958	1058	1158	1260	1364	1468	1572	1676	1780	1884	1988	2092	2196	2300	2404	2508
32	226	320	423	522	620	710	808	908	1012	1116	1220	1328	1436	1544	1652	1760	1868	1976	2084	2192	2300	2408	2516	2624
33	236	334	441	544	646	740	840	944	1052	1160	1272	1384	1496	1608	1720	1832	1944	2056	2168	2280	2392	2504	2616	2728
34	246	348	460	568	674	774	880	988	1098	1212	1328	1444	1560	1676	1792	1908	2024	2140	2256	2372	2488	2604	2720	2836
35	256	362	478	590	700	804	916	1032	1152	1272	1396	1520	1644	1768	1892	2016	2140	2264	2388	2512	2636	2760	2884	3008
36	266	376	496	614	730	840	960	1084	1212	1344	1476	1608	1740	1872	2004	2136	2268	2400	2532	2664	2796	2928	3060	3192
37	276	390	514	638	760	876	998	1128	1264	1404	1548	1692	1836	1980	2124	2268	2412	2556	2700	2844	2988	3132	3276	3420
38	286	404	532	662	790	912	1044	1188	1336	1488	1644	1800	1956	2112	2268	2424	2580	2736	2892	3048	3204	3360	3516	3672
39	296	418	550	684	818	948	1092	1248	1408	1572	1740	1908	2076	2244	2412	2580	2748	2916	3084	3252	3420	3588	3756	3924
40	306	434	570	708	848	984	1136	1296	1468	1644	1824	2008	2192	2376	2560	2744	2928	3112	3296	3480	3664	3848	4032	4216
41	316	448	588	732	880	1024	1184	1352	1532	1716	1908	2104	2304	2508	2712	2916	3120	3324	3528	3732	3936	4140	4344	4548
42	326	462	606	758	914	1064	1232	1412	1604	1808	2016	2228	2444	2660	2876	3092	3308	3524	3740	3956	4172	4388	4604	4820
43	336	476	624	782	944	1104	1284	1480	1688	1908	2132	2360	2592	2824	3056	3288	3520	3752	3984	4216	4448	4680	4912	5144
44	346	490	642	804	974	1144	1336	1544	1768	2008	2256	2512	2772	3032	3292	3552	3812	4072	4332	4592	4852	5112	5372	5632
45	356	504	658	824	1004	1184	1392	1616	1856	2112	2376	2652	2936	3220	3504	3788	4072	4356	4640	4924	5208	5492	5776	6060
46	366	518	676	848	1038	1228	1452	1696	1960	2244	2536	2840	3152	3464	3776	4088	4400	4712	5024	5336	5648	5960	6272	6584
47	376	532	694	872	1072	1272	1512	1776	2064	2376	2704	3048	3400	3760	4120	4480	4840	5200	5560	5920	6280	6640	7000	7360
48	386	548	714	900	1112	1324	1584	1872	2192	2544	2912	3296	3696	4104	4520	4944	5368	5792	6216	6640	7064	7488	7912	8336
49	396	564	734	928	1152	1376	1656	1972	2324	2704	3104	3528	3972	4432	4904	5384	5864	6344	6824	7304	7784	8264	8744	9224
50	406	580	756	960	1196	1440	1712	2048	2432	2856	3312	3792	4296	4816	5352	5896	6440	6984	7528	8072	8616	9160	9704	10248
51	416	598	778	992	1240	1504	1792	2144	2568	3032	3536	4064	4616	5184	5760	6344	6928	7512	8096	8680	9264	9848	10432	11016
52	426	614	800	1024	1284	1572	1888	2272	2728	3232	3768	4336	4936	5552	6184	6824	7464	8104	8744	9384	10024	10664	11304	11944
53	436	630	822	1056	1328	1632	2000	2416	2904	3432	4000	4600	5232	5896	6584	7288	7992	8696	9400	10104	10808	11512	12216	12920
54	446	646	840	1088	1372	1692	2088	2536	3064	3632	4240	4880	5560	6272	7008	7760	8512	9264	10016	10768	11520	12272	13024	13776


APPENDIX 13 -- SAMPLE PLOT FORMS

1998 EASTERN OREGON INVENTORY PLOT RECORD

County _____ () Date _____ Recorder(s) _____

Plot Number _____ Estimator(s) _____

PLOT LAYOUT										RP Data	RP Location and Description
.	species _____	
.	.	.	.	.	.	.	.	.	.	diameter _____ cm
.	.	.	.	.	.	.	.	.	.	azimuth _____
.	.	.	.	.	.	.	.	.	.	slp dist _____ m
.		
.		
.		
.		
.		
.		
.		
.		
.		
.		
.		
Items to be Field Checked _____											
Items to Alert Office About _____											
Is the Downloaded Owner Class Correct? (Y or N) _____ If NO, Explain _____											
Was the Ground Land Class of Subplot 1 Misclassified as Occasion 3? (Y or N) _____											
If YES, Explain _____											
CPS Data:	Subplot Number	File Number	Date Downloaded								

OREGON CONDITION CLASS MAP NONFOREST INCLUSION MAP COUNTY _____ () PLOT _____ 16.95 M CIRCLE Calculator: % of Plot Area = $\frac{\# \text{ of counted dark dots}}{4,54}$ One dark dot = 0.22% of 16.95m circle One dark dot = 2.70% of 5m circle. One dark dot = 11.11% of 2.41\2.96m circle. 100% (1) = 454 dark dots 50% (1/2) = 227 dark dots 25% (1/4) = 114 dark dots 12.5% (1/8) = 57 dark dots Light dot interval = 1 meter, dark dot = 2 meters Concentric Circles = 2.41\2.96, 5, 10, 15, 16.95 m  SCALE METERS		
Condition Class Boundary Az — Az — Dist — Dist — 360° Dist — 315° 45° 270° 90° 225° 135° 180° Subplot # 3 Non Forest Inclusion Map — %	Condition Class Boundary Az — Az — Dist — Dist — 360° Dist — 315° 45° 270° 90° 225° 135° 180° Subplot # 1 Non Forest Inclusion Map — %	Condition Class Boundary Az — Az — Dist — Dist — 360° Dist — 315° 45° 270° 90° 225° 135° 180° Subplot # 2 Non Forest Inclusion Map — %
Condition Class Boundary Az — Az — Dist — Dist — 360° Dist — 315° 45° 270° 90° 225° 135° 180° Subplot # 4 Non Forest Inclusion Map — %	Condition Class Boundary Az — Az — Dist — Dist — 360° Dist — 315° 45° 270° 90° 225° 135° 180° Subplot # 5 Non Forest Inclusion Map — %	

OREGON FOREST INVENTORY

COUNTY (...) PLOT (...) DATE

0c3 MAP/POINT:...../... T/R/S/40:

0c4 Photo- Proj:... Roll: ... Prints: ...
Month:... Year:

CONDITION CLASS RECORD

-- CONDITION CLASS IDENTIFICATION--	-----CONDITION CLASSES-----				
	1	2	3	4	5
1 COUNTY	...				
2 PLOT	...				
3 ZONE
4 SAMPLE KIND
5 OWNER CLASS
6 OCC4 INVENTORY DATE				
7 OCC3 INVENTORY DATE				
7 OCC3.5 INVENTORY DATE				
8 OCC4 GROUND LAND CLASS
9 OCC3 GROUND LAND CLASS	..				
10 BASAL AREA FACTOR				
11 PRECIPITATION (CM)	...				
12 ELEVATION (M)				
13 HYDROLOGIC UNIT CODE				
14 CONDITION CLASS ASPECT
15 CONDITION CLASS SLOPE
16 TOPOGRAPHIC POSITION
17 SOIL DEPTH
18 HARVEST BEFORE OC3
19 YEAR OF HARVEST BEFORE OC3
20 DISTURBANCE BEFORE OC3
21 HARVEST SINCE OC3
22 YEAR OF HARVEST SINCE OC3
23 YEAR OF HARVEST SINCE OC3 CONFIRMED
24 DISTURBANCE SINCE OC3
25 SILVICULTURAL TREATMENT SINCE OC3
26 TYPE OF LOGGING
27 FOREST TYPE
28 STAND SIZE
29 STAND AGE
30 PLANT ASSOCIATION
31 STAND CONDITION
32 CROWN CLOSURE AT OC3
33 CROWN CLOSURE AT OC4
34 OC3 REMEASUREMENT PERIOD
35 OC3.5 REMEASUREMENT PERIOD

OREGON FOREST INVENTORY

COUNTY (...) PLOT (...) DATE

SUBPLOT ATTRIBUTES

SUBPLOT NUMBER	. 1	. 2	. 3	. 4	. 5
SBPLT CNTR COND CLASS

PHYSIO CLASSIFICATION

ASPECT	...	...	...	...	...
SLOPE	..	..	..	..	..
TOPO POSITION	.	.	.	.	.
STREAM CLASS	.	.	.	.	.
STREAM PROXIMITY	..	..	..	..	..

SITE IMPACTORS (% of 17m subplot)

	CC	% CC	% CC	% CC	% CC	% CC
NONFOREST INCLUSN

% OF 17M SUBPLOT IN

EACH CONDITION CLASS	%	%	%	%	%
CONDITION CLASS 1	..	..	..	..	..
CONDITION CLASS 2	..	..	..	..	..
CONDITION CLASS 3	..	..	..	..	..
CONDITION CLASS 4	..	..	..	..	..
CONDITION CLASS 5	..	..	..	..	..

SITE TREES

SUB PLT C										
#	#	C	TRN	AZM	SPC	DBH	HT	AGE	SI	EQ
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

COUNTY (...) PLOT (...) OREGON FOREST INVENTORY TREE TALLY DATE PAGE .. OF ..

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Sub		0c3 035 0c3 0c4 0c3 0c4 BH										Agt Agt Agt																		
Line	Number	Pl	Cc	Th	Spc	Azm	Dist	Trn	Inc	Inc	Dbh	Dbh	Hgt	Hgt	Age	C	R	C	C	M	Cl	Co	Cr	1	S1	2	S2	3	S3	Remarks

COUNTY (...) PLOT (...) OREGON FOREST INVENTORY TREE TALLY DATE PAGE .. OF ..

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Sub		0c3 035 0c3 0c4 0c3 0c4 BH																Agt	Agt	Agt										
Line	Number	Pl	Cc	Th	Spc	Azm	Dist	Trn	Inc	Inc	Dbh	Dbh	Hgt	Hgt	Age	C	R	C	C	M	Cl	Co	Cr	1	S1	2	S2	3	S3	Remarks

OREGON FOREST INVENTORY

COUNTY(. . .) PLOT(. . .) DATE

VEGETATION PROFILE (2.41, 2.96M - 16.95M ON SK 3)

SUBPLOT NUMBER	. 1	. 2	. 3	. 4	. 5	..	..	..
CC OF SUBPLOT CENTER	1	.	.	.	.	.	.	.
% IN SBPLT CENTER CC	..	..	..	..	..	..	..	..
TOTAL VEG COVER	..	..	..	..	..	..	..	..
PERCENT BARE SOIL	..	..	..	..	..	..	..	..

S L -----PERCENT COVER-----

OC3	OC4	D A	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC	OC
SPC	SPC	V Y	3	4	3	4	3	4	3	4	3	4	4	4	4	4

SHRUBS:

[illegible]

TOTAL SHRUBS

LAYER HTS

(1) (2)

FORBS:

[illegible]**TOTAL FORBS**

LAYER HTS

(1) (2)

OREGON FOREST INVENTORY

COUNTY(...)..... PLOT(...) DATE

VEGETATION PROFILE (2. 41, 2. 96M - 16. 95M ON SK 3)

 S L -----PERCENT COVER-----
 OC3 OC4 D A OC OC OC OC OC OC OC OC OC OC OC OC OC
 SPC SPC V Y 3 4 3 4 3 4 3 4 3 4 3 4 4 4 4

TREE SEEDLINGS:

.....

LAYER HTS 17m
 (1) (2) (1) (2) (3)

GRASS:

.....

TOTAL GRASS

LAYER HTS
 (1) (2)

SEEDLING COUNT (2. 41, 2. 96M)

 -----SUBPLOT NO-----
 . 1 . 2 . 3 . 4 . 5

-----SPECIES-----

YEW-SPROUT 230
 YEW-SEEDLING 231

OREGON FOREST INVENTORY

COUNTY (...) PLOT (...)

DATE

CROWN COVER TALLY

LYR HTS:	CONDC .	LYR 1 ...	LYR 2 ...	LYR 3 ...
	CONDC .	LYR 1 ...	LYR 2 ...	LYR 3 ...
	CONDC .	LYR 1 ...	LYR 2 ...	LYR 3 ...

ITEM	1	2	3	4	5	6	7	8
SUB								
PLT	T	S	C	SPC	L	DIST1	DIST2	
						(DCM)	(DCM)	

ITEM	1	2	3	4	5	6	7	8
SUB								
PLT	T	S	C	SPC	L	DIST1	DIST2	
						(DCM)	(DCM)	

[illegible]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	8												

COUNTY (...) PLOT (...) DATE

CROWN COVER TALLY

LYR HTS:	CONDC .	LYR 1 ...	LYR 2 ...	LYR 3 ...
	CONDC .	LYR 1 ...	LYR 2 ...	LYR 3 ...
	CONDC .	LYR 1 ...	LYR 2 ...	LYR 3 ...

[illegible]

COUNTY (...) PLOT (...) DATE

COARSE WOODY DEBRIS ATTRIBUTES

[illegible]

COUNTY (...) PLOT (...) DATE

COARSE WOODY DEBRIS ATTRIBUTES

[illegible]

RESIDUE PILES

[illegible]

COUNTY (...) PLOT (...) DATE

STOCKING TALLY

[illegible]

COUNTY (...) PLOT (...) DATE

STOCKING TALLY

[illegible]

OREGON

X and R Subplot Mapping

COUNTY _____ () PLOT _____

16.95 M CIRCLE

Calculate: % of plot Area = $\frac{\# \text{ of counted dark dots}}{4.54}$

One dark dot = 0.22% of 16.95m circle

One dark dot = 2.70% of 5m circle.

One dark dot = 11.11% of 2.41\2.96m circle.

100% (1) = 454 dark dots

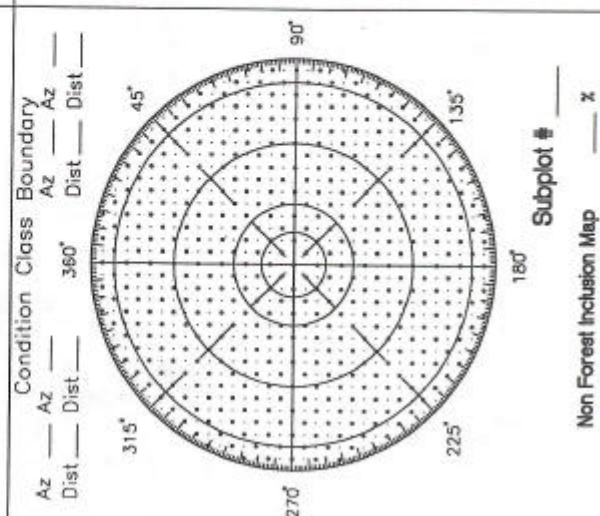
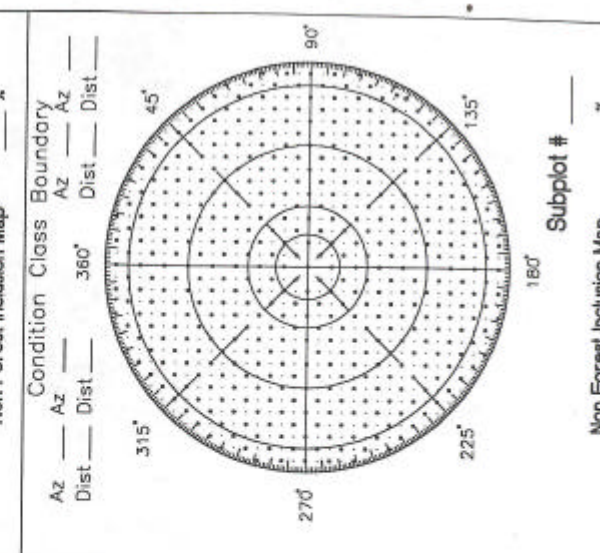
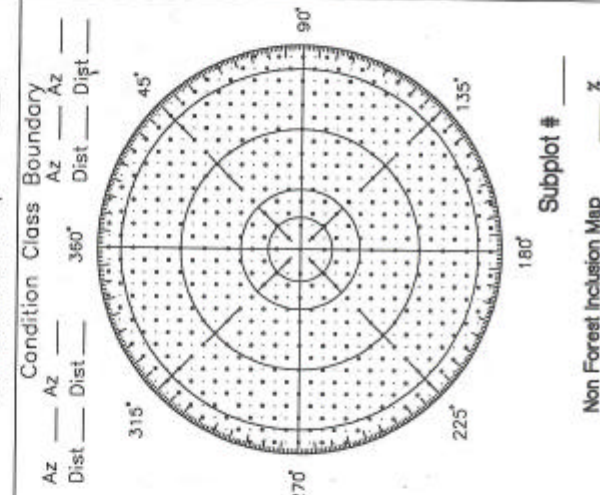
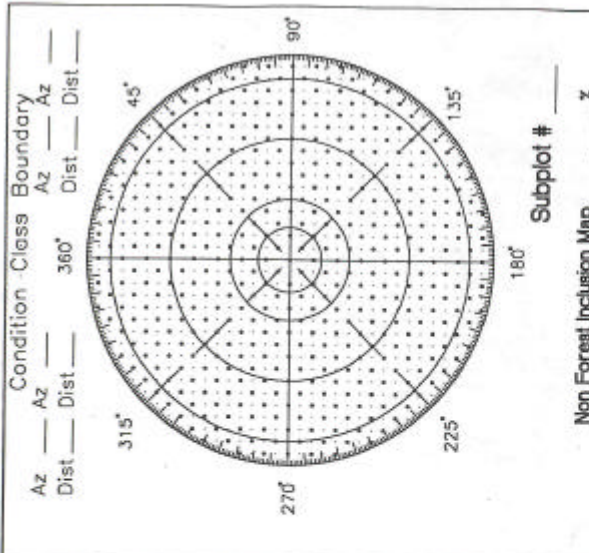
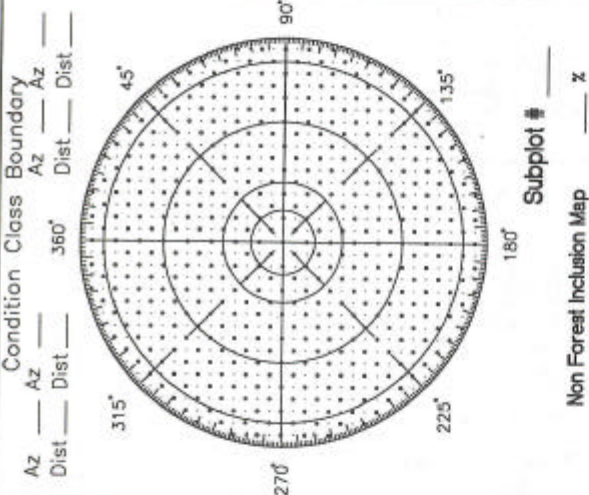
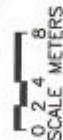
50% (1/2) = 227 dark dots

25% (1/4) = 114 dark dots

12.5% (1/8) = 57 dark dots

Light dot interval = 1 meter, dark dot = 2 meters

Concentric Circles = 2.41\2.96, 5, 10, 15, 16.95 m



APPENDIX 14 -- INDEX

- ## subplot, 20
- 17m fixed veg profile plot
 - if new plot replaces, 24
 - when to install, 82
- 2.35m fixed radius, 87, 91
- 3.3m stocking subplot, 158
- 5.0m fixed radius plot, 82
 - % Veg profile in area, 85
- access-denied plots
 - crown closure, 70
- active logging, 13
- additional sources of documentation, 4
- age
 - breast height age, 111
 - on large trees, 112
- agents, 119
- amputated area, 33, 36
- armillaria root rot, 205
- aspect
 - condition class, 62
 - subplot, 45
- BAF 7, 91
- bark beetles, 120, 206
- baseline, 12
- black stain root rot, 206
- BLM (on subplot), 57
- boundary
 - distinct, 31
 - indistinct, 32
- C# subplot, 20, 21, 24
- canopy layers-tree cover, 150
- canopy layers-veg profile, 86
- cause of death, 124
- census water (on subplot), 57
- check trees, 91
- checklist of items needed on plot, 7
- clearcut when subplot in condition class 1, 21
- clump, 115
- coarse woody debris-CWD
 - "No tally", 135
 - length, 137
 - line transects, 130
 - orientation, 139
 - piles, residue, 140
 - rules if piece in 1 cond class, 130
 - rules if piece in cond class 2-5, 133
 - slope percent, 140
 - tagging and marking, 135
 - transect cond class distance, 140
- condition class
 - attributes, 53, 55
 - determining, 26
 - estimate and record %'s, 50
 - identifying boundaries, 31
 - mapping, 49
 - nonforest, mapping, 26
 - recognizing, 26
 - recording physioclass info, 71
- contact office about, 18, 61
- contacts-CWD, 138
- county codes, 55
- crown class
 - on tally trees, 113
- crown closure, 70
- crown ratio
 - on tally trees, 112
- cull other, 116
- cull rot, 118
- cultural nonforest stringers, 32
- culturally-killed tree, 101
- cutbanks, 32
- damaging agent, 119
- DBH
 - half diameter, 107
 - impossible-to-measure trees, 108
 - large end-CWD, 137
 - marking DBH, 105
 - measuring DBH, 106
 - point of intersection-CWD, 136
 - small end-CWD, 137
- decay class
 - CWD, 138
 - snags, 125
- defoliators, 120
- design, of inventory, 4
- disappearance codes-for snags, 124
- double sample, 4
- drip line, 146
- elevation, 62
- extrapolated age, 112
- fill along roads, 32
- fire
 - damaging agents, 123
- first Aid, 9
- fixed-radius plot, 91
- forest land definition, 59
- forest type, 67
- form class, 117
- free-to-grow stocking, 159
- GeoExplorer GPS, 166
- GPS, 163, 165, 171
 - batteries, 169
- ground land class
 - codes, 59
 - definitions, 59
 - Oc3, 61
- habitat type, 68
- hardwood clump, 115
- hardwood tree form, 117
- harvest use, 125
- harvested trees, 101

- height
 - on leaning trees, 110
 - on poorly-formed trees, 110
 - on snags, 110
 - on tally trees, 109
- inclusion, nonforest, 47
- increment, 102
- ingrowth trees, 101
- inhibiting vegetation, 161
- intermingled forest/nonforest, 35
- inventory design, 4
- inverted cone method, 158
- kind of disturbance
 - before previous occasion, 66
- laminated root rot, 205
- landowner contact, 7
- layer heights
 - in veg profile, 86
 - tree cover, 150
- locating the plot, 11
- location description, 41
- logs, volume
 - merchantability minimums, 116
 - tree volume charts, 117
- lost plot, 39
- low productivity forest land, 61
- maintained structures, 32
- mapping
 - condition class, 49
 - nonforest inclusions, 47
- merchantability minimums, 116
- minimum area rules
 - forest stand condition, 27
 - ground land class, 26
- missed tree, 101
- mistletoe, 114
- mortality tree, 101
- moved subplot
 - definition, 18
- N# subplot, 20, 21, 24
- National Forest (on subplot), 57
- necks, 32, 34
- nonforest inclusions, 47
- nonforest land definition, 61
- owner class, 57
- ownership
 - definitions, 58
- permission, 7
- physical defects, 123
- planting, 66
- PLGR GPS Unit, 167
- plot layout, 15, 17
 - at OC4, 18
 - on plots visited at Oc3, 20
 - Plot layout and subplot numbering at Oc4 on new plots, 24
- plot layout Oc3, 17
- POD, 12
- poison oak, 9, 106
- precommercial thin, 66
- precommercial thin-stocking, 162
- present condition/past disturbance
 - site trees, 75, 76
- present conditon/past disturbance
 - site trees, 76
- R# subplot, 20, 21
- reconstruct definition, 21
- reconstructed tree, 101
- reference trees, 42
- referencing a plot, 39
 - not visited previously, 40
 - visited previously, 39
- remeasurement period, 71
 - calculating, 103
- residue piles, 140
- roads
 - definition, 32
- root diseases
 - agent codes, 122
- RP, 40
 - azimuth, 41
- safety, 8
- sample kind, 56
- seedling count, 87
- severity, 119
- silvicultural treatment, 66
- site index, 78
- site trees
 - on previously visited plots, 75
 - preferred species, 76
 - selecting, 75
- slivers, 26
- slope
 - condition class, 62
- snag
 - decay class, 125
 - reason for disappearance, 124
 - use or reason for disappearance, 124
 - wildlife use, 124
- soil depth, 62
- species
 - CWD, 136
 - trees, 101
 - veg, 83
- stage of development, 86
- stand age, 67
- stand condition, 70
- stand condition, broad, 27, 28
 - determining separate, 27, 28
- stand density index "SDI", 75
- stand size, 67
- standard plot layout, 19
- start of line, 149
- stem decays
 - cull rot, 118
 - damaging agents, 121

- step 1 stocking trees, 158
- step 2 stocking trees, 159
- stockability indicator set, 70
- stockability indicators, 78
- stocking subplots
 - crop tree, 160
 - layout and numbering, 155
 - tree selection, 158
- stream
 - class, 47
- stream
 - proximity, 47
- streams
 - is it nonforest?, 32
- stringers, 32, 34
- stumps-stocking, 162
- subplot numbering
 - on new plots, 24
 - on plots visited at Oc3, 20
- substituted subplot
 - definition, 18
- suppression, 122
- topographic position
 - subplot, 46
- topographic position
 - condition class, 62
- tree cover, 145
 - cond class boundary, 145
 - tally rules, 146
- tree history, 99
- tree number, 102
- tree selection rules, 93
- tree tally
 - data recording, 99
 - seedling selection rules, 96
 - tree and snag selection, 93
- two-class rule, 27
- type of logging, 66
- unknown plants, 88
- variable radius sampling, 91
- veg profile
 - 17m plot, 82
 - canopy layers-separating, 86
 - is it a shrub?, 84
 - percent cover, 85
 - R subplots, 81
 - splitting species, 84
 - unknown plants, 88
- volume deductions
 - cull other, 116
 - cull rot, 118
- weather-damaging agent, 123
- wildlife use on snags, 124
- yew seedling count, 88

APPENDIX 15A -- IMPORTANT PHONE NUMBERS

List of important office and home telephone numbers included in field-going version of manual only.

APPENDIX 15B -- VEHICLE & PHONE NUMBERS

List of field vehicles and cell phone numbers included in field-going version of manual only.

APPENDIX 16 -- BLANK PAGES FOR NOTES

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